INSTRUCTION MANUAL
MISSIMERS MODEL FT1-100x500
BENCH MODEL TEMPERATURE TEST CHAMBER
SERIAL NO. C-993
SANDIA P.O. NO. 730 251

BULLETIN NO. G-60

MISSIMERS

INCORPORATED

ENVIRONMENTAL

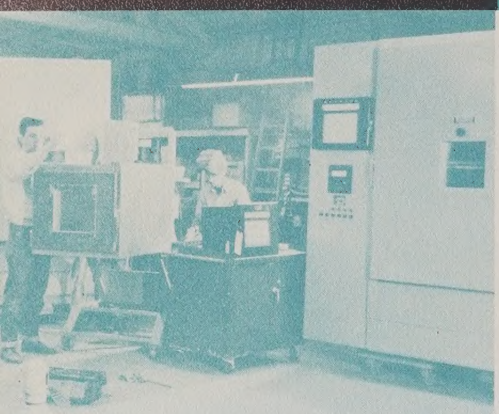
test chambers

SPECIALIZED

refrigeration equipment

DESIGNED AND MANUFACTURED BY **MISSIMERS INCORPORATED** FORMERLY PACIFIC REFRIGERATION CO.

WHAT'S MEANT BY MISSIMERS



SPECIALIZING in design and application engineering, as well as the fabrication of technical refrigeration systems, Missimers Incorporated has built a reputation for efficient, high quality equipment over the past quarter of a century.

Known as the Pacific Refrigeration Co. from 1932 until 1956, Missimers engineered and built one of the early altitude and low temperature walk-in test chambers in 1942. Since that time more emphasis has been placed on technical and environmental applications. Today, as industrial processing and testing needs become more and more demanding, Missimers can offer a complete line of advanced, high-quality equipment for both production process needs and environmental testing, and can also provide a wide background of experience for engineering and building of specialized systems where necessary.

Equipment manufactured by Missimers has been installed throughout the country, and national recognition has been accorded the Company through much technical work on cascade refrigeration systems and special application test chambers. Further developmental work includes designs and equipment having performance beyond present requirements, such as lower temperatures approaching the cryogenic range, higher rates of temperature change and higher simulated rates of climb in altitude test chambers.

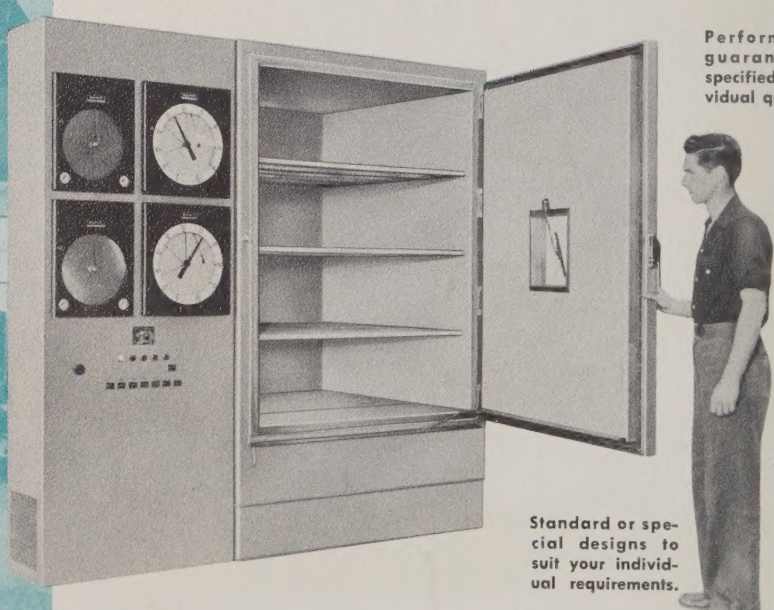
The units shown here are representative of the type of application-proved equipment which can be provided by Missimers. More complete data is available on many models, and Missimers will be happy to discuss your own specific refrigeration or environmental test chamber problems.

HERE'S WHY MISSIMERS MEANS *PLUS* PERFORMANCE AND VALUE...

Instrumentation and controls to suit your exact job—from a simple thermostat to complete electronic programming or automated systems.

Electrical panels meet both national and local codes. Branch circuit protection, manual switches, pilot lights and other accessories furnished as required.

Stationary, portable or mobile designs — remote mechanical equipment when desired.



Performance is guaranteed as specified in individual quotations.

Full instruct manuals . . . s matic wiring piping diagra and a compl bill of mate assist operat and maintena for long, trou free service.

Missime neering are ava design your own lar appli

Simple, depe able, easy- service condit ing systems k operating cost a minimum.

Standard or special designs to suit your individual requirements.

THERE'S A STANDARD OR CUSTOM-BUILT MISSIME

perature chamber
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-100 to +200 F.

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cycle heating or
unit for process
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e. Standard sizes
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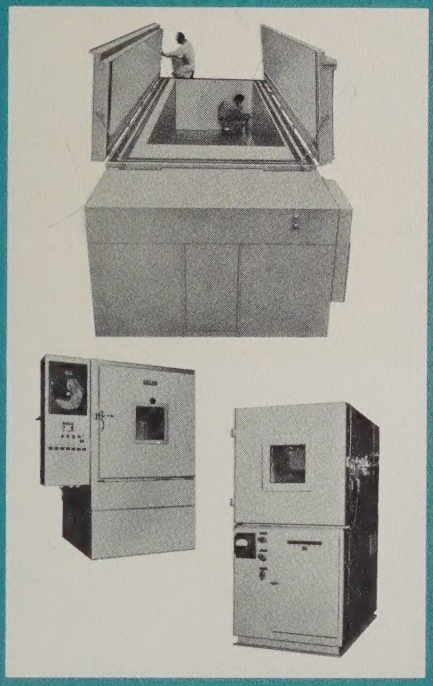
any requirement.



ENVIRONMENTAL TEST CHAMBERS

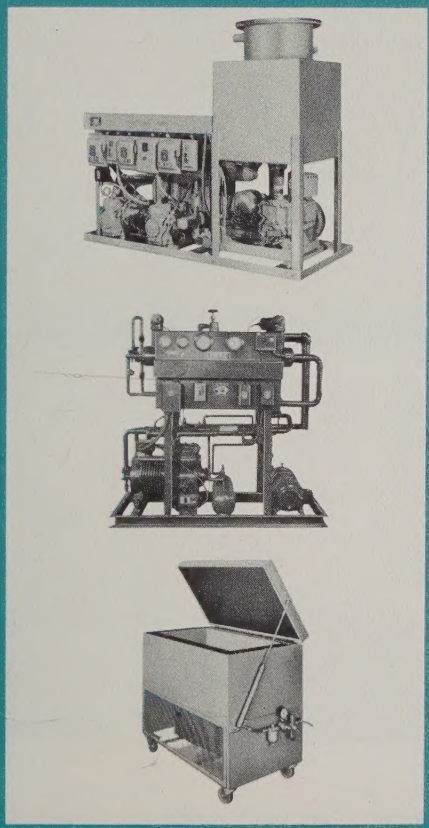
In addition to Missimers' complete line of environmental chambers for temperature, altitude, humidity, weather and fungus testing, special chambers are available for use with many types of physical testing machines. These allow vibration, tension, compression, bending and tortional stress testing while under simulated environmental conditions of temperature, humidity or altitude.

Ranges for temperature testing chambers are from —300 F (with liquid nitrogen) to 1000 F, full or limited range. Conditioning systems are matched for individual customer requirements, and heating is directly or indirectly by electrical resistance heaters.

Humidity testing from 35 F dew point to 200 F dry bulb temperatures . . . altitude testing from site level to 250,000 feet.

Combination chambers of any two or more (humidity, temperature or altitude) are available over a temperature range of —125 F to 350 F.

Semi-standard sizes range from 1 cu. ft. to 64 cu. ft. with smaller, larger or special sizes available at a slight additional engineering cost.



PROCESS EQUIPMENT

FOR *AIR* PROCESSING Typical applications for Missimers' air processing equipment or systems are constant temperature and humidity rooms for the testing or making of paper products, printing, etc., or for maintaining constant low humidity for processes such as grinding or mixing of moisture absorbing materials.

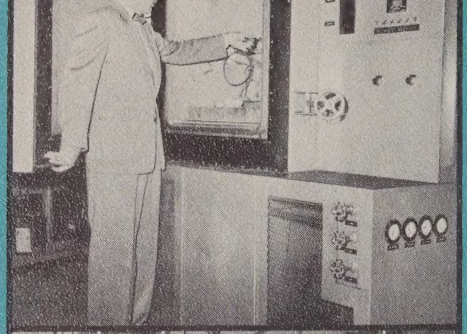
Other air process equipment includes applications for reducing dew points of compressed air by refrigeration or refrigeration and desiccants . . . vacuum drying equipment with refrigeration vapor condensing surfaces or heated vacuum dehydration equipment . . . and many other specialized jobs.

FOR *LIQUID* TEMPERATURE CONTROL Missimers units produce temperatures from —130 F to 300 F for a wide range of applications. These include refrigerated brine systems for "heat sinks" in test set-ups where temperatures from ambient to —130 F are required, using suitable brines such as methanol, methylene chloride, trichlorethylene, glycol-water solutions, water, or water-salt solutions.

Equipment for controlling temperatures of hydraulic oil in test stands, chillers or constant temperature units for photographic or chemical reaction processes, and constant temperature baths for calibration or special processing are examples of Missimers quality equipment available in this category.

***METAL* PROCESSING EQUIPMENT** Portable aluminum rivet freezers, stationary or portable aluminum parts refrigerators and ultra-low temperature chambers for hardening, stabilization or shrink fitting of metals are available with liquid baths, forced or natural air circulation. These units can be supplied in sizes, capacities and arrangements to suit your individual needs, and all are designed to Missimers standards of performance and reliability.

SUIT *YOUR* INDIVIDUAL NEEDS!



An altitude and temperature test chamber being used in the laboratory of General Controls Company.

Heat treat hardening of valve parts in this Missimers chamber at quench temperatures of —125 F.

One of a battery of six environmental test chambers used in conjunction with tensile-testing machines by a large aircraft manufacturer. Temperature range: —90 to +600 F.

PROVED PERFORMANCE!

Behind every piece of equipment fabricated by Missimers, Incorporated, is the experience gained over hundreds of applications, both standard and specialized.

Qualified engineering designs, skilled fabrication and a thorough testing of each unit before delivery are your best assurance of efficient, trouble-free performance.

Many units by Missimers which have been operated continuously for years . . . and still performing at initial capacities . . . are the best recommendation as to the dependability and quality of Missimers equipment.

A FEW OF THE MANY USERS OF MISSIMERS QUALITY EQUIPMENT

Aerojet-General Corporation
Airesearch Manufacturing Company
American Machine & Foundry Company, Turbo Engineering Dept.
Beckman Instruments Company
Boeing Airplane Co.
California Institute of Technology—Jet Propulsion Laboratory
Convair-Division of General Dynamics Corporation
Douglas Aircraft Company
General Controls Company
Lockheed Aircraft Corporation
Minnesota Mining & Manufacturing Company
North American Aviation, Inc.
Northrop Aircraft Company
Radio Corporation of America
U. S. Marine Corps
University of California—AEC Contracts Division, Los Angeles, Calif.
U. S. Naval Ammunition & Net Depot
U. S. Naval Air Missile Test Center
U. S. Naval Ordnance Test Station
U. S. Navy Yards & Docks

MISSIMERS INCORPORATED

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MISSIMERS INCORPORATED

CIAL REFRIGERATION EQUIPMENT *ENVIRONMENTAL TEST CHAMBERS*

7 SAN FERNANDO ROAD CHAPMAN 5-8471 GLENDALE 4, CALIFORNIA

ruction Manual: Model FTI-100x500 Special Bench Model Temperature Test Chamber
Serial No. C 993

ation

General - The cascade system is two independent refrigeration circuits arranged so that the refrigerant from the low stage is condensed by the evaporation of the refrigerant in the high stage. There are seven major components in the system: (1) low stage evaporator which cools the product or test space (2) low stage compressor or motor-compressor unit, (3) low stage expansion device, (4) cascade condenser (low stage condenser and high stage evaporator), (5) high stage compressor or motor-compressor unit, (6) high stage expansion device, and (7) high stage condenser. There are also additional refrigeration appurtenances such as refrigerant heat exchangers, dryer-strainers, expansion tanks, valves, and electrical accessories.

Service Connections - Electrical power of 115 volt, single phase, 60 cycle should be supplied for the plug provided. Equipment must be placed so that there is no restriction to free air flow across the condenser. The unit must not be placed in a location where any of the air openings are covered or against a wall.

Start-up - After connecting to the power source, the high stage refrigeration compressor will start. After the high stage has operated for a period of about 3 to 5 minutes, the low stage may be energized by turning on the switch marked "Cool" and setting the controller to the desired low temperature. Note: If the high stage does not start when plugged in as can be determined by the running of the condenser fan, turn on the "Cool" switch momentarily with the controller set below its indicated point, then turn it off again.

The low stage evaporator will commence cooling; the temperature in the workspace, or of the load will be reduced at an approximate steady rate until the set point is reached.

System Control - In order to achieve system balance between the high and low stage circuits, both stages must be controlled such that they are neither overloaded, nor too lightly loaded. The high stage condensing unit is cycled on and off by a reverse acting (close on rise) high pressure switch connected to the low stage discharge. The high pressure cut-out on the low stage cycles the compressor off when the high stage capacity is not adequate to handle the heat rejected from the low stage. The low stage suction pressure is limited to the same approximate maximum as for Freon-12, that is, 10 - 15 psig. This is achieved by the characteristics of the thermal expansion valve, and a suction pressure limiter switch and valve.

Temperature Control - The temperature of the workspace is normally held at the desired set point by either on-off cycling of the low stage compressor or heaters.

Adjustments - Resetting the temperature control to different settings according to various requirements is the only adjustment that should be necessary. The settings of the pressure switches, etc. should not be changed except by a person completely familiar with the system and its operation.

vice and Maintenance

General - It is unlikely that any part of the system will require regular maintenance, except for cleaning the high stage condenser. The hermetic type motor-compressors have their lubricating oil sealed within the system , and unless there is a leak with resulting loss of oil, no oil will have to be added, once the correct amount of oil is added on initial start up.

Do not allow snow or ice to build up on blower. Snow may be blown off with an air blow gun or brushed off. Use care to avoid damaging the blower. At high speed unbalance is serious.

Low Stage Evaporator - Frost may be removed from the wall cooling plates by scraping or by warming the unit up to room temperature.

Low Stage Motor-Compressor - Hermetically sealed compressors require no attention as far as lubrication is concerned; however, the adequacy of motor cooling and the condition of the refrigerant gas entering and leaving the compressor may be checked by feeling it while running; the temperature should not be above about 130 F or about as hot as one's hand can stand continuously. The suction gas entering the compressor should be cool or cold. If the frost on the suction line covers more than the suction service valve, a service man should be called and the unit shut down. The discharge line should be hot to the touch, but not so hot that the hand cannot be held on it momentarily.

Cascede Condenser - No service or maintenance is required

High Stage Compressor - Same as low stage compressor, plus check to make certain condenser fan motor operates.

High Stage Condenser - The condenser should be checked about once a month to be certain that the entering air side is clean. If it should be plugged with dirt and/or lint, it can be cleaned with a compressed air blow gun, a vacuum cleaner, or a brush.

Expansion Tank - High stand-by pressures are prevented by means of a refrigerant expansion tank which allows all liquid refrigerant in the low stage system to expand into a superheated gas at room temperature upon shut down or power failure. The high side refrigerant is by-passed by the relief valve connected to low side.

Many lines and valves are installed in the insulated enclosure. Whenever service is performed, these components should be reinsulated as soon as possible and the outside vapor seal carefully restored. Most of the low stage circuit operates at temperatures well below room dew points, therefore care must be taken to be certain that moisture does not reduce the insulating value of the materials on the lines, thereby reducing the system capacity.

Normal Operating Pressures -

High Stage Refrigerant:	Condensing 90 to 150 psig
	Evaporating 0 to 10 psig
Low Stage Refrigerant:	Condensing 120 to 200 psig
	Evaporating 5 to 10 psig

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Approximate Refrigerant Charges -

1. High Stage - 2 lbs. of Refrigerant-12
2. Low Stage - 2 lbs. of Refrigerant- 13

Service Checks when Unit is not Cooling:

1. First, the unit should be unplugged and left this way for about an hour. Before plugging back in, the "Cool" switch should be turned to the off position. About 20 minutes after plugging back in, the switch can then be turned to "On". At this time the second compressor (low stage) should start to run and the chamber will commence cooling. If either compressor should show indications of shutting off due to the overcurrent device, as indicated by a snapping noise, this procedure should be repeated.

   The initial start up procedure is the same as outli
   unit should be plugged in first with the "Cool" swi
   then turned to "On" after about 20 minutes. (See n

   If the chamber does not cool, this procedure should be repeated.

   If the above does not start the chamber coolin the rear access panel into the insulated space may be removed to check to be certain that the expansion valves have not clogged due to oil pumping of the compressors after a prolonged period of shut-down. The valves should be warmed to above room temperature by the hand or a rag with
   cigaret lighter. This procedure should not be necess
   unit has not been operated for a long period of t
   and the rear panel should not be left off any long

   If the system is operated conti
   as fool proof and service free as a home freezer.

   If service gauges are connected to the fo
   should be attached by means of short (1
   (1/4 OD or smaller) diameter copper tubing;
   connected into the gauge connections to make c
   valve on the discharge side should be shut off first
   equalized to the suction side, than the chamber
   can be shut off and the gauges removed. In this
   of refrigerant in the system will not be affected.

MISSIMERS INCORPORATED

IAL REFRIGERATION EQUIPMENT *ENVIRONMENTAL TEST CHAMBERS*

SAN FERNANDO ROAD CHAPMAN 5-8471 GLENDALE 4, CALIFORNIA

Missimers Incorporated Product Warranty

The Company warrants the products of its manufacture to perform as specified in the brochure or specifications describing the product, and to be free from defects in materials and workmanship under the normal use and service for which they were intended.

Parts or equipment will be replaced, FOB our plant, for any failures occurring within a period of 120 days from date of shipment or 90 days from date of initial start up, whichever should occur sooner provided that: (1) the equipment has been operated in a normal manner, and within the limits of the designed duty, (2) the equipment has been properly maintained, and (3) written notice of any defect is given within 15 days from date such defect is first discovered.

Our obligation is limited to repairing or replacing at our plant any products or parts thereof which upon our inspection prove to be defective. Any purchased equipment such as motors, compressors, valves, etc. which carry a longer guarantee period will retain the guarantee extended to us by that manufacturer.

The Company shall not be liable for consequential damage resulting from the use of its products.

This warranty is expressly in lieu of all other warranties, express or implied, and all other obligations or liabilities on the part of Missimers Incorporated. Any deviations in the intent or scope of this warranty are valid only if made in writing by an Officer of the Company.

8-17-60

Printed in U. S. A.

MISSIMERS INCORPORATED

IAL REFRIGERATION EQUIPMENT *ENVIRONMENTAL TEST CHAMBERS*

7 SAN FERNANDO ROAD CHAPMAN 5-8471 GLENDALE 4, CALIFORNIA

Control - In order to achieve system bal[illegible] between the [illegible] circuits, both stages must be controlled such that they are [illegible] loaded, nor too lightly loaded. The high stage condensing unit is [illegible] cycled on and off by a reverse acting (close on rise) high pressure switch con[illegible] nected to the low stage discharge, or suction [illegible] of the low stage [illegible] on the low stage cycling the compressor [illegible] attempt to handle the load rejected from the high stage. The [illegible] pressure is limited to the [illegible] turn low back pressure machines. Methods of [illegible] liquid line solenoid valve ahead of the expansi[illegible] acting low pressure control, (2) a thermal ex[illegible] fice or restrictor, (3) an automatic expansion [illegible] low stage refrigerant charge, or (4) by compr[illegible]

Temperature Control - The temperature of the [illegible] held at the desired set point by either [illegible] compressor and/or liquid solenoid valve [illegible] control of the system. On time proportional [illegible] is using a suction solenoid valve to shut off [illegible] with valve opening and closing to limit the [illegible] these systems, the compressor is permitted to [illegible] short cycling would greatly shorten the life of [illegible] In order to prevent the compressor suction pressure from [illegible] a "balanced loader" is generally incorporated to use the [illegible] charge vapors to evaporate a small flow of liquid [illegible] into the suction.

Adjustments - Resetting the temperature control [illegible] according to various requirements is the only [illegible] that is necessary. The settings of the pressure and [illegible] expansion etc. should not be changed except by a person [illegible] with the system and its operation.

MAINTENANCE

Motors - It is unlikely that any part of the system will require regular maintenance except for open type motors used on blowers, vacuum pumps, open type compressors, and the high stage condenser. The hermetic type refrigerant compressors have their lubricating oil sealed within the system and unless there is a leak with resulting loss of oil, no oil will have to be added, once the correct amount of oil is added on initial startup.

Low Stage Evaporator - Frost may be removed from wall plate types by defrosting or by warming the unit up to room temperature. On blower types, frost may be removed with a compressed air blow gun which will easily knock off the loose frost. [illegible] Frost or ice on a fan should be carefully removed. The motor for a [illegible] type will require lubrication according to normal practice for its type. Sleeve bearing types should be oiled once a month [illegible] bearing types greased once every six months. The sealed shaft assembly in an altitude chamber should be checked regularly to make certain that it has adequate oil and that it does not run excessively hot.

C. Low Stage Motor-Compressor - Hermetically sealed compressors require no attention as far as lubrication is necessary. However, the efficiency of motor cooling and the condition of the refrigerant are important and therefore the compressor requires periodic checking. [illegible] the motor should be felt while running the temperature should not exceed 150F or about as hot as [illegible] suction gas entering the compressor should be cool or cold. Frost on the line should not extend onto the [illegible] if the frost on the suction line covers more than the suction [illegible] valve, a serviceman should be called and the unit shut down. The discharge line should be hot to the touch, but not so hot that the hand cannot be held on it momentarily.

D. Low Stage Expansion Valve - [illegible] only by a serviceman; adjustments to the expansion valve should by [illegible] the suction is frosted too far onto the compressor or if the suction [illegible] sure is running too low and the suction line is not cool. Setting [illegible] be such that the superheat at evaporator outlet is from 10 to 15 deg[illegible]

E. Cascade Condenser - No service or maintenance is required.

F. High Stage Compressor - Same as low stage compressor.

G. High Stage Expansion Valve - Same as low stage expansion valve.

H. High Stage Condenser -

1. For air cooled units, the condenser should be checked about once a month to be certain that the entering air side is clean. If it should be plugged with dirt and lint, it can be cleaned with a compressed air blow gun, a vacuum cleaner, or a brush.

2. Water cooled condensing units will require attention fairly frequently to check for dirty water regulating valves, scaled or plugged condensers, and, if used, dirty cooling towers. A water regulating valve gives an indication of being fouled when the water runs with the compressors shut off. The valve may be flushed by prying against the spring with a screw driver. If this fails to dislodge the dirt, it should be disassembled and cleaned or replaced if too badly eroded or corroded. The condenser may be cleaned by standard acid or mechanical methods. If a cooling tower is used, it should be flushed out at least once a month.

3. Evaporative condensers require flushing down at least once a month. The water supply should be treated for a minimum of scale formation. When the high stage condensing pressure becomes abnormally high, scale on the tubes is usually indicated. They may be descaled by chemical methods commonly employed for this type of equipment.

I. Expansion Tank and By-Pass Means - On Freon-13 systems high stand-by pressures are eliminated by means of an expansion tank which allows the liquid refrigerant in the low stage system to expand into a super-heated gas at room temperature upon shut down. The high side refrigerant is bypassed across the compressor to the low side by means of a normally

open solenoid valve, pressure relief valve, [illegible] or capillary tube. A serviceman should check the stand-by pressure twice a year to make certain that it is not abnormally high or low.

J. Many lines and valves are insulated or installed to [illegible]. Whenever service is performed, these components should be reinsulated as soon as possible and the outside vapor seal carefully restored. [illegible] the low stage circuit operates at temperatures well below [illegible] therefore care must be taken to be certain that moisture does not reduce the insulating valve of the materials on the lines, thereby reducing the system capacity.

K. Normal Operating Pressures -

Freon-12/Freon-13 Cascade

High Stage Freon-12: Condensing 90 to 150 psig
evaporating 10 in hg to 35 psig
Low Stage Freon-13: Condensing 110 to 220 psig
evaporating 10 in hg to 30 psig

[illegible]

[illegible]
Condensing 180 to 240 psig air cooled
Evaporating Zero to 40 psig
[illegible] Freon-13: Condensing 95 to 220 psig
Evaporating 10 in hg to 30 psig

[illegible]
Oct. [illegible]

ADJUSTMENTS

General - The cascade system generally is used for producing either a [illegible] erature such as process equipment, or for variable temperatures as test equipment requires. The adjustments which are required are made to provide optimum operation within the range of conditions encountered. This means that neither compressor should be overloaded at anytime and that all heat exchangers should operate at the minimum temperature differential.

Sequence:- The adjustments are first started on the "high side" then the "low side" of the high stage, the same for the low stage.

Water Regulating Valve - When the system is water cooled using waste city [illegible], then the water regulating valve must be adjusted to hold the high stage head pressure to a reasonable level under conditions of maximum load. This normally is at a condensing temperature about 15 to 25 deg F above the entering water temperature. This can be checked by measuring the entering water temperature and high stage condensing pressure, and observing the difference between the saturated condensing and water temperatures.

High Stage High Pressure Cut-Out - This is used on water cooled systems to turn off high stage compressor whenever its condenser does not [illegible] heat. Normal adjustments are about 185 psi cut-out and [illegible] and 250 psi cut-out and 190 psi cut-in for Freon-22.

High Stage Cut-in - Used to turn on high stage when low stage Freon-13 condensing pressure rises. Normal setting is about 150 psi (L.S. head pressure), and 120 psi cut-out.

Low Stage High Pressure Cut-out - Used to turn off low stage compressor when the high stage compressor is unable to remove an adequate amount of heat to hold the low stage discharge pressure down to a point where low stage compressor will not be overloaded. Normal setting is about 280 psi cut-out and 170 psi cut-in depending upon motor current at highest normal suction pressure. It is set so that no overload will occur.

Low Stage Suction Pressure Control - Used to cycle the low stage liquid solenoid valve such that the suction pressure is prevented from rising too high with a consequent overload of the low stage compressor. The setting is dependant upon the ratio of horsepower to displacement and is usually set [illegible] level for maximum hp. for the same compressor operating with Freon-12 or lower. Normal ranges are 40 plus or minus 5 psi, 25 plus or minus 5 psi, 10 plus or minus 5 psi and zero plus or minus 2 psi for the cut-out point on pressure rise, and a cut-in point about 5 to 8 psi lower. The solenoid should cycle frequently enough to hold the suction pressure as steady as possible but not more frequently than about 5 to 10 seconds per cycle.

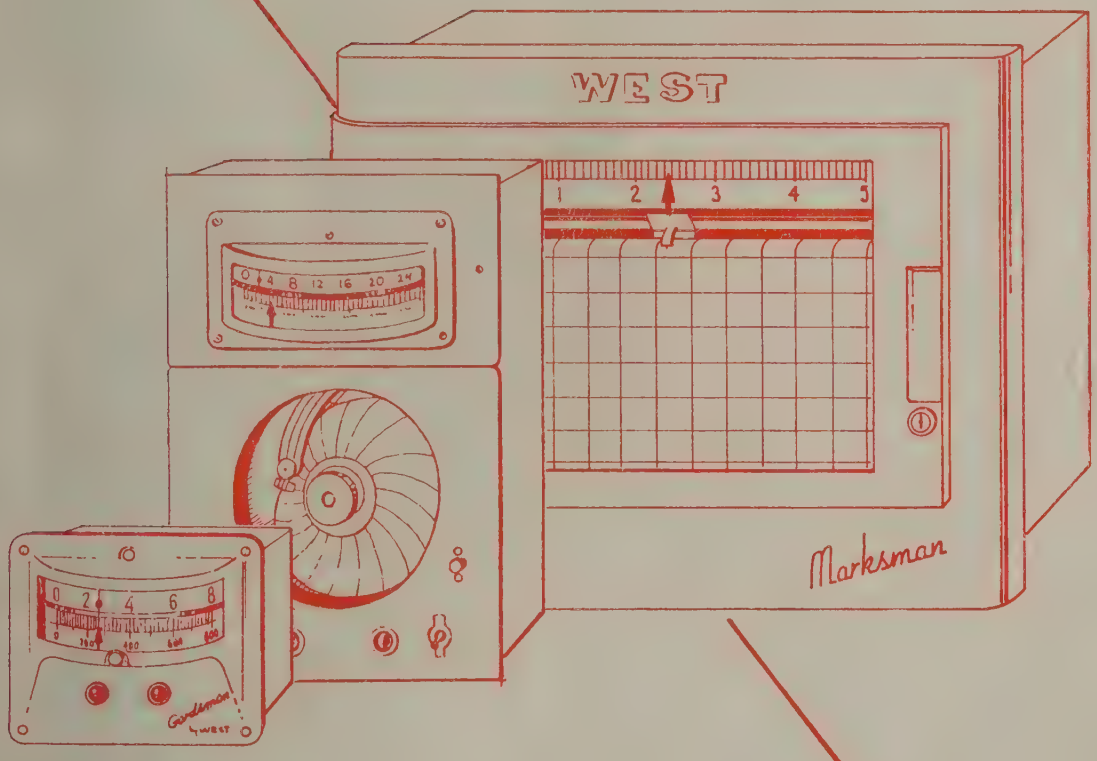
High Stage Expansion Device - The expansion valve should be set so as to hold an approximate 10 deg F superheat at the remote bulb for thermal type valves, or at the evaporator (cascade condenser) outlet when constant pressure valves are used. This can best be measured by comparing saturated evaporating temperature (found from table or curve of pres. vs. temperature) with the actual temperature.

Low Stage Expansion Device - The low stage valve is handled in a manner similar to the high stage except that checks are made at the highest operating temperature when the system is not being limited by the various means and at the lowest operating temperature. The latter is more important since this is the point at which the system capacity is more critical.

OPERATING AND SERVICE INSTRUCTIONS

MODEL

JP



WEST Instrument CORPORATION

4363 W. MONTROSE AVE. • CHICAGO 41, ILLINOIS

CABLE ADDRESS — WESTINST CHICAGO

BRITISH SUBSIDIARY: WEST INSTRUMENT LIMITED

52, REGENT ST., BRIGHTON 1, SUSSEX

CABLE ADDRESS — WESTINST LONDON

General Instructions

UNPACKING THE INSTRUMENT

Your West Gardsman Instrument and associated equipment was carefully packed and fully inspected before shipping. If it was damaged enroute, retain packing materials and notify your carrier at once, requesting inspection.

Caution: Handle instruments with care and avoid shock.

SPECIFICATIONS

(A) Thermocouple:
The type of thermocouple is shown on the lower edge of the scale as follows:

I/C - - - - - - - - - - Iron vs. Constantan
C/A - - - - - - - - - - Chromel vs. Alumel
PT/PT 13% RH. - 13% Rhodium, 87% Platinum vs. Platinum
PT/PT 10% RH. - 10% Rhodium, 90% Platinum vs. Platinum
CU/C - - - - - - - - Copper vs. Constantan
CR/C - - - - - - - - Chromel vs. Constantan

(B) The external resistance for which the meter has been calibrated is shown on the lower edge of the scale and is the combined resistance of the thermocouple and lead wire or is shown as the actual lengths and gauges of the thermocouple and lead wire.

(C) The instrument will operate on 115 Volts or 230 Volts A.C. depending upon which (115 or 230) terminals are used. Frequency of power supply must be same as shown on rating plate. Voltage may vary ± 10% from normal without adverse effects.

(D) All models except JSB Series have relay contact ratings of 4 amperes at 115 Volts and 2 Amperes at 230 Volts A.C. for non-inductive loading. For inductive loads, decrease ratings 50%.

DESCRIPTION

(A) The Gardsman Indicating Pyrometric Controller is a precision instrument designed to:

1. Sense a temperature at the tip of the thermocouple and indicate it by the position of the upper (green) pointer on the instrument scale.
2. Through suitable control action, maintain any temperature at which the lower (red) pointer has been set.

(B) Three circuits are involved for control:

1. The thermocouple circuit, consisting of the thermocouple itself (two dissimilar metal wires joined at one end) is connected to the instrument panel directly or by lead wires of specific materials. Within the instrument this circuit is completed and the voltage generated by the heated thermocouple tip passes to the millivoltmeter, deflecting the upper pointer.
2. The amplifying circuit, in which current passing through the photocell is amplified by a magnetic amplifier to operate a relay or control winding on a saturable core reactor. A small bulb and the photocell are mounted on the same setting arm that carries the lower pointer. As long as the light from the bulb strikes the cell, sufficient current flows either to energize a relay or saturate a reactor so maximum current will flow. When the temperature reaches the preset position of the lower pointer, a small flag carried on the upper pointer interrupts the light beam, causing the output of the photocell to drop to a point where the relay will release or the reactor is no longer saturated so minimum current will flow.
3. The control circuit terminals are completely isolated from the amplifying circuit and must be powered separately. See external wiring diagrams.

BEFORE INSTALLING

(A) On all models except the JG Series, remove the meter from the case by loosening the four corner screws. These are captive screws and will remain in the meter cover. Pull meter forward firmly. Handle with care.

(B) Be sure the line voltage and frequency to be used are the same as shown on the rating plate.

(C) Be sure the voltage supplied to auxilliary equipment is correct.

LOCATION

(A) Select location for the instrument where it will not be subjected to excessive shock, vibration, dirt, moisture or oil seepage. The maximum ambient temperature where the controller is located should not exceed 130° F.

(B) Avoid glaring reflections on scale glass.

MOUNTING

(A) Moderate care should be used to mount the instrument level.

(B) Instruments should be mounted as shown in mounting dimensions drawing. Instruments can be flush or surface mounted. Surface mounting screws and brackets are supplied with each instrument.

WIRING

(A) Be sure the line voltage and frequency used are the same as shown on the rating plate. Wiring terminals are accessable by removing meter on all models except the JG and JSB series. On Models in the JG Series, open the door and remove screw to the right of the meter scale. This will allow meter and programming frame to swing out. On Model JSB series, line connections are made on the driver chassis. Only Thermocouple break protection and inter-connecting circuit cable enter the meter housing.

(B) Refer to external wiring diagrams for suggestions on typical circuits.

(C) Run all wiring in conduit, pipe or Greenfield (BX) over entire length in accordance with local electrical code. Run thermocouple lead wire in separate conduit. Wires for TCBP (if used) can be run in the same conduit with lead wire.

(D) Ground the instrument case. A grounded conduit system is usually sufficient.

(E) Use properly fused switches, to protect the instrument. See external wiring diagrams.

(F) Use extension lead wire of the type specified for your instrument and thermocouple and of the length and gauge or the proper resistance shown on the lower edge of the scale. Copper wires will not serve the purpose.

(G) Clean ends of wires for good contact and maintain polarity when wiring the thermocouple lead wires. If polarity is not known, check for proper polarity of lead wires by connecting them to thermocouple terminals on instrument panel and observing movement of instrument pointer when the free ends are held together and heated with a match. If polarity is incorrect, the pointer will deflect downscale and connections at the instrument panel must be reversed.

(H) The thermocouple should then be connected to the lead wires, again being careful to observe polarity. The positive lead wire should be connected to the positive terminal on the connector block. When wired correctly, the meter pointer will deflect upscale when heat is applied to the tip of the thermocouple.

(I) The use of improper lead wire or the reversing of lead wire polarity will still permit the meter to indicate an increase of temperature if the thermocouple is wired correctly, but there will be an error in the indicated temperature.

(J) Thermocouple location should be selected to secure prompt response to changes in temperature. It is important to keep in mind that the indicated temperature is that at the tip or hot junction end of the thermocouple. The location of the hot junction should be away from the load far enough to be partially affected by the source of heat to reduce overshooting. Be sure that a protecting tube is provided over the thermocouple if the atmosphere or bath may cause contamination of the thermocouple, as such deterioration will eventually result in false readings.

(K) Thermocouple break protection is available in each instrument and can be used if desired. If there is any possibility that the thermocouple may break due to high temperature, corrosion or flexing in use, it is desirable to use this feature. Connect copper wires from the TCBP terminals on the instrument panel to the thermocouple connector block as shown on the external wiring diagrams. Do not jumper on panel as error in reading will result. Observe polarity. Use any suitable gauge wire. 20 Ga. is usually preferred. If this feature is not desired, do not wire to these panel connections.

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Control Instructions

MODELS J AND JP

ADJUSTMENTS AND CHECKS BEFORE USING

(A) After instrument case has been mounted and wired, remove shipping jumper wire that is twisted around the thermocouple connection and shipping terminal on the terminal panel of the instrument. This connection electrically dampens the meter movement for protection in shipping or handling.

NOTE: Replace shipping jumper wire when handling or reshipping the instrument. If you are shipping the meter section only, then wrap wire around all the rear meter prongs.

(B) To check ambient temperature adjustment, place meter section in level position. The green pointer should come to rest at the ambient (meter) temperature. It is not supposed to read zero.

(C) If the pointer does not come to rest at the ambient temperature, it should be adjusted by slowly turning the zero adjust screw above the scale until the pointer rests at the instrument temperature as checked by a thermometer with its bulb directly on the instrument.

Your instrument is equipped with an automatic cold junction compensator. By using extension lead wire from the thermocouple cold end to the meter terminals, the effective cold junction is brought to the instrument. The automatic compensator in the instrument eliminates need for further adjustment.

(D) Place meter in housing. Tighten corner screws after starting the threads on each screw.

(E) To check operation of thermocouple break protection (TCBP), if used, disconnect thermocouple from connector block, simulating a broken thermocouple. Pointer should then go upscale past the control set point. If the pointer goes downscale, TCBP leads are open or reversed. This check should be made with power on the instrument.

(F) Check the auxilliary equipment independently of the controller, after wiring is completed, to guard against faulty wiring and possible damage to the controller contacts. Close all manual fuel valves, or open the electrical heating switch if separate from the control circuit.

(G) To check instrument control operation, power the instrument. The green light will operate momentarily and the red light will light if the red setting pointer is set up scale with respect to the green indicating pointer. Control terminals C to L are now made. Using the control setting knob below the scale, move the red pointer slowly downscale past the indicating pointer. As the pointers coincide, the control relay will release. Terminals C to H are now made and the green light will come on.

OPERATION

(A) The control set point (red pointer) is adjustable by use of the external knob, located below the scale.

(B) The indicating pointer (green pointer) will move to indicate the temperature of the hot junction of the thermocouple. All power for the meter is generated by the thermocouple, no batteries or other power sources are necessary.

(C) Instrument will keep the heat on until the indicating pointer reaches the set point. Red pilot light will be on. The control will turn the heat off when the indicating pointer reaches the set point. The green pilot light will then operate. Thus the instrument will operate to control the temperature on and off at the desired control point.

MAINTENANCE

(A) Be sure instrument is not subjected to excessive heat at any time.

(B) Do not oil or grease any part of the instrument at any time. Pivot and jewel construction is used for the meter movement.

(C) Do not permit accumulations of oil or moisture on the instrument.

(D) Inspect all terminal connections regularly, both thermocouple and control circuits.

(E) Examine thermocouple regularly for signs of deterioration such as scaling or breaks. Replace thermocouple if symptoms are apparent as they may cause accuracy to be affected. The protection tube should be examined for leaks.

(F) Once a year, if the instrument is used continuously, it is desirable to replace the light source to assure uninterrupted service. Follow instructions for replacing given under "Servicing".

SERVICING

(A) Follow symptoms and checks below:

SYMPTOM	CHECK
Neither pilot light burns	1. Check power supply to the instrument, fuses, etc. 2. Check pilot light bulbs.
Green pilot light on at all times	1. Check for low line voltage. 2. Is meter plugged into chassis all the way? 3. Is light source bulb burned out? See (C) below. 4. Try new photocell. See (D) and (E) below.
Red pilot light on at all times.	1. Check for high line voltage. 2. Is flag on indicating pointer free to pass between light and photocell? 3. Try new photocell. See (D) and (E) below.
Instrument pilot lights operate normally, but furnace over-heats or will not heat.	1. Check wiring from HCL terminals to external contactor or other load. 2. Check operation of external contactors, solenoids, motor valves, etc. 3. Check instrument relay contacts. See (F) below.
Instrument not reading correct temperature.	1. Check thermocouple and lead wire connections. 2. Check ambient temperature setting. See "Adjustments and Checks before using". 3. Check thermocouple for deterioration and lead wire for correct polarity. See "Wiring".

(B) In the event of an overshoot of the set temperature due to improper location of thermocouple or on the initial heating up, the indicating pointer will be restrained from extreme upward movement by a pointer stop on the setting arm. Do not distort this stop.

(C) The light source must be burning at all times when the controller is operating. If it is burning, its glow may be observed above and below the instrument scale. It is a standard miniature bayonet type bulb (#44-6.3 V. - .25 amp. - blue bead) obtainable at any radio shop or hardware store. This bulb is interchangeable with the pilot light bulbs.

(D) To replace the light source, loosen the four corner captive screws and remove the meter from the housing. Handle with care. After removing any dust from the top of the meter, remove access hole cover from the top of the meter housing. Turn the setting arm knob clockwise until the red pointer is at full scale. The light may be reached through the access hole. Pull reflector upward to remove. Push down on bulb and turn counterclockwise until it is disengaged from the bayonet socket and replace with new bulb. Replace reflector with opening toward scale, replace cover and replace meter in housing.

(E) To replace the photocell, follow the same procedure as under (D), removing cell by pulling it upward without turning. The new cell must be inserted in the socket with the small spot of clear glass facing the light source.

(F) Relay contacts may wear in time or may become dirty. Dirty contacts may be cleaned by gentle polishing with crocus cloth. Care should be exercised not to distort the spring adjustment. The adjustment of relay contacts is critical. It is recommended that an entire new relay be installed when contacts are burned badly. Such installation should be made at the factory where possible.

(G) In the event that an instrument requires service, not covered by the above procedures, contact your local West Instrument representative or the factory.

SHIPMENT OF INSTRUMENTS

If the instrument must be re-shipped, replace the shipping jumper on the instrument panel, rotate the setting knob counter-clockwise until the red pointer is all the way to the left end of the scale. If the indicator assembly only is to be shipped, twist a piece of wire around all prongs on the back panel to act as shipping jumper. Wrap the instrument carefully in paper and place it in a snug fitting carton, sealed with tape to keep out dust from packing material. Place this carton inside a larger one with at least three inches of padding between the two cartons.

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Special Data

VOLTAGE & FREQ. CONVERSION, CORRELATION AND PHOTO CELL AND LIGHT SOURCE REPLACEMENT

TO CHANGE FREQUENCY

(ALL INSTRUMENTS EXCEPT MODEL JSB SERIES)

INSTRUMENTS WIRED FOR 60 CYCLES HAVE A GREEN LEAD FROM THE REACTOR (SEE FIG.1) SOLDERED TO TERMINAL B. **NOTE: FOR JT SERIES TWO WIRES ARE LOCATED ON THIS TERMINAL. ALWAYS MOVE BOTH WIRES.**

INSTRUMENTS WIRED FOR 50 CYCLES HAVE A GREEN LEAD FROM THE REACTOR SOLDERED TO TERMINAL A.

TO CHANGE FROM 60 TO 50 CYCLES OPERATION, UNSOLDER GREEN LEAD FROM B AND RESOLDER TO A.

TO CHANGE FROM 50 TO 60 CYCLES OPERATION, UNSOLDER GREEN LEAD FROM A AND RESOLDER TO B.

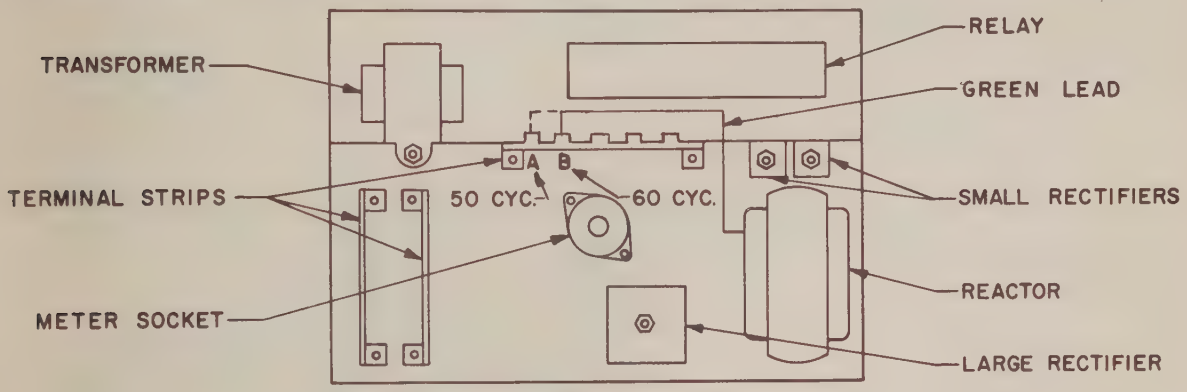


FIG. 1 BACK VIEW OF CONTROL CHASSIS

TO CHANGE TO 208V.

(ALL INSTRUMENTS EXCEPT MODEL JSB SERIES)

INSTRUMENTS ARE NOW EQUIPPED WITH A TRANSFORMER WHICH HAS A 208V. TAP. ON THE BACK OF THE CONTROL CHASSIS AT THE TRANSFORMER (SEE FIG.1), IS A LOOSE BLACK-RED LEAD MARKED "208V." TO CONVERT TO 208V., UNSOLDER THE BROWN LEAD WHICH GOES FROM THE TRANSFORMER TO THE 230V. TERMINAL ON THE TERMINAL PANEL, AT THE PANEL. RESOLDER THE 208V. LEAD TO THIS TERMINAL. REMOVE THE 208V. MARKER FROM THE WIRE AND PLACE IT ON THE FRONT OF THE PANEL TO MAKE NOTE OF THE CONVERSION. TAPE THE END OF THE BROWN LEAD THAT WAS REMOVED. BY CONNECTING 208V. TO THE 230V. TERMINALS, THE INSTRUMENT WILL FUNCTION PROPERLY.

CORRELATING THE INSTRUMENT

THIS SHOULD BE DONE IF THE GREEN INDICATING AND THE RED INDEX POINTERS DO NOT COINCIDE AT THE POINT WHERE CONTROL ACTION IS INITIATED. NOT MAKING THIS ADJUSTMENT WILL NOT AFFECT THE OPERATION OF THE INSTRUMENT SINCE THE INDICATING POINTER ALWAYS INDICATES TRUE TEMPERATURE AND SET POINTER MAY BE SET UP OR DOWN SCALE TO COMPENSATE FOR THE DIFFERENCE.

TO BRING THE TWO POINTERS IN LINE IT IS NECESSARY TO MOVE THE RED POINTER EITHER TO THE RIGHT OR LEFT. FIRST NOTE HOW MANY SCALE DIVISIONS THE POINTER MUST BE MOVED, AND IN WHICH DIRECTION. IT MAY THEN BE MOVED BY EITHER ONE OF TWO METHODS.

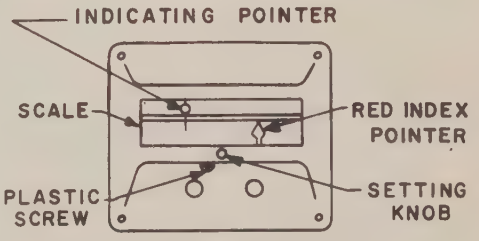


FIG. 2 METER FRONT

METHOD 1, FOR NEWER INSTRUMENTS:

REMOVE BLACK PLASTIC SCREW FROM THE UNDERSIDE OF THE FRONT DIRECTLY UNDER THE SCALE. (SEE FIG. 2). BY MOVING THE RED POINTER NEAR TO THE HOLE IT CAN BE PUSHED EITHER RIGHT OR LEFT WITH THE END OF A MECHANICAL PENCIL PUSHED THROUGH THE HOLE. HOLD SETTING KNOB SO IT DOES NOT TURN WHILE MAKING ADJUSTMENT. AFTER MAKING ADJUSTMENT, MOVE THE RED POINTER TO THE INDICATING POINTER TO SEE IF CONTROL ACTION TAKES PLACE WHERE THEY COINCIDE. (INSTRUMENT POWERED). IF NOT, REPEAT PROCEDURE. WARNING: DO NOT MOVE RED POINTER FAR ENOUGH TO TOUCH SCALE OR POINTER WILL BIND.

METHOD 2, FOR OLDER INSTRUMENTS:

LOOSEN THE FOUR CORNER SCREWS ON THE INSTRUMENT AND PULL METER FORWARD AND OUT OF THE HOUSING. AFTER BLOWING OFF ALL DUST, PRY UP THE PLUG BUTTON IN THE TOP OF THE METER. TURN THE SETTING KNOB CLOCKWISE UNTIL THE RED POINTER IS AT THE TOP OF THE SCALE. THE SETTING ARM CARRYING

THE PHOTO CELL AND LIGHT SOURCE IS THEN VISABLE THROUGH THE HOLE. TO THE SIDE OF THE SETTING ARM IS A SMALL BRASS PLATE WITH A SCREWDRIVER SLOT.(SEE FIG.3). INSERT A SMALL SCREWDRIVER INTO THE SLOT AND TURN CLOCKWISE OR COUNTER-CLOCKWISE TO ADJUST RED POINTER THE REQUIRED DISTANCE. REPLACE PLUG BUTTON AND REPLACE METER IN HOUSING. MOVE THE RED POINTER TO THE INDICATING POINTER(INSTRUMENT POWERED) TO SEE IF CONTROL ACTION TAKES PLACE WHERE THEY COINCIDE. IF NOT, REPEAT PROCEDURE. AFTER ADJUSTMENT HAS BEEN COMPLETED, TIGHTEN THE FOUR CORNER SCREWS.

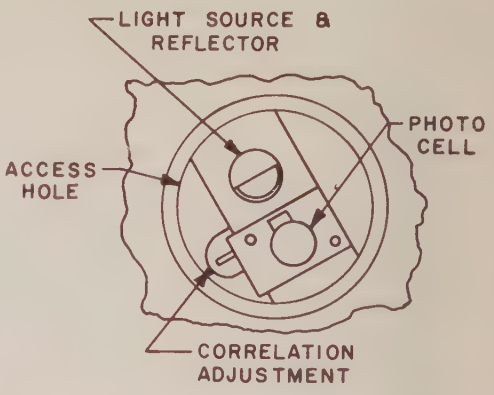


FIG. 3 VIEW THROUGH ACCESS HOLE

TO REPLACE PHOTO CELL

FOLLOW THE INSTRUCTIONS GIVEN UNDER "CORRELATING THE INSTRUMENT", METHOD 2, FOR REMOVING METER AND PLUG BUTTON(OR **COVER ON NEWER INSTRUMENTS**).

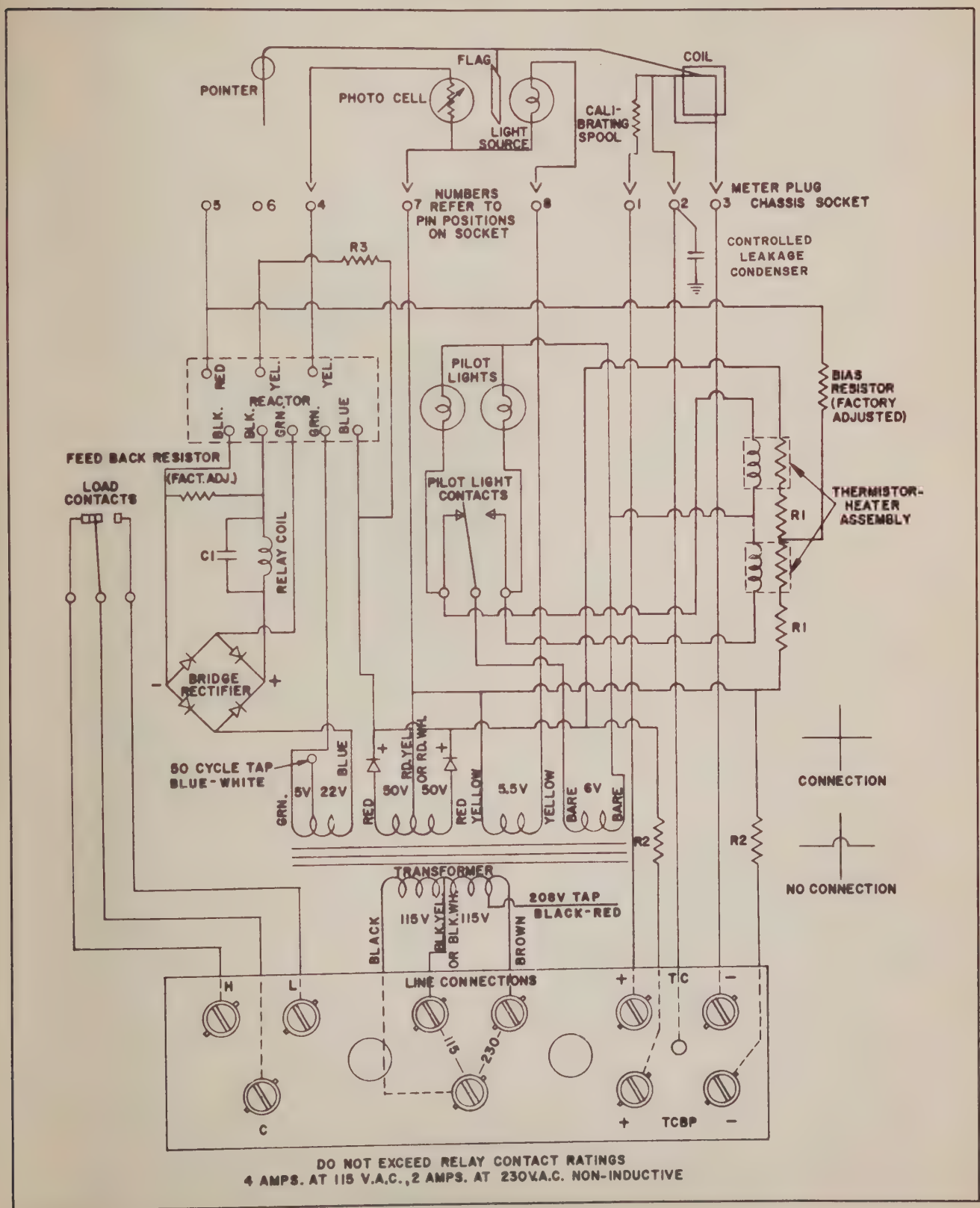
TO REMOVE PHOTO CELL, PULL UP WITHOUT TURNING. REPLACE NEW CELL WITH WINDOW FACING LIGHT SOURCE. REPLACE PLUG BUTTON AND REPLACE. METER IN HOUSING. PROCEDURE SHOWN UNDER "CORRELATING THE INSTRUMENT" USUALLY MUST BE FOLLOWED AFTER REPLACING CELL.

TO REPLACE LIGHT SOURCE

FOLLOW SAME PROCEDURE AS REPLACING PHOTO CELL, EXCEPT LIGHT SOURCE IS REMOVED BY PRESSING DOWN AND TURNING COUNTER-CLOCKWISE. WHEN REPLACED, THE OPEN SIDE OF THE REFLECTOR MUST FACE THE PHOTO CELL.

Internal Wiring

MODEL JP



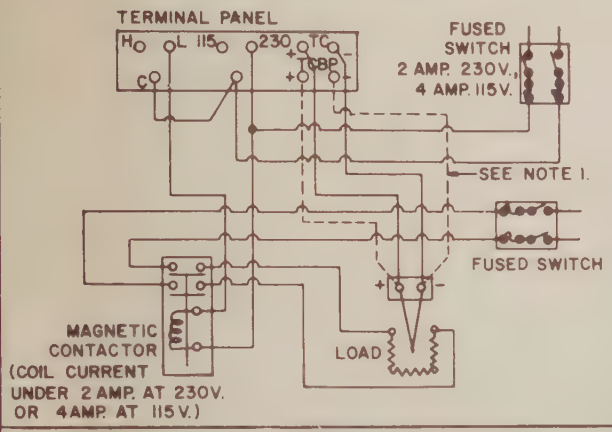
DO NOT EXCEED RELAY CONTACT RATINGS
4 AMPS. AT 115 V.A.C., 2 AMPS. AT 230 V.A.C. NON-INDUCTIVE

WEST Instrument CORPORATION

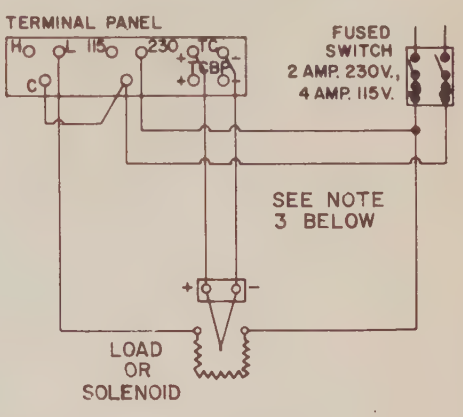
External Wiring

MODELS J AND JP

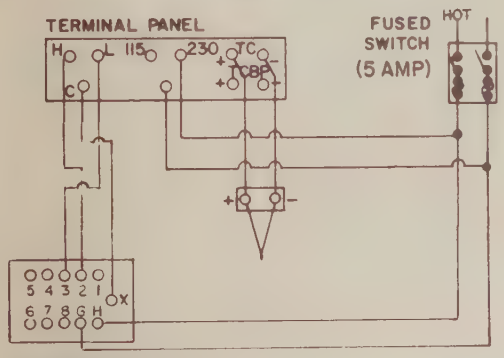
① LARGE ELECTRIC LOAD WITH CONTACTOR



② SMALL ELECTRIC LOAD

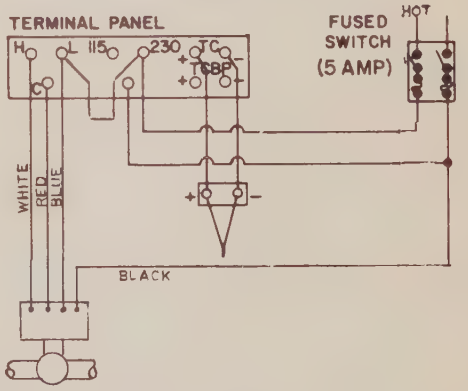


③ REVERSIBLE CONTROL MOTOR



BARBER-COLMAN
REV. HYCC-CLASS-2

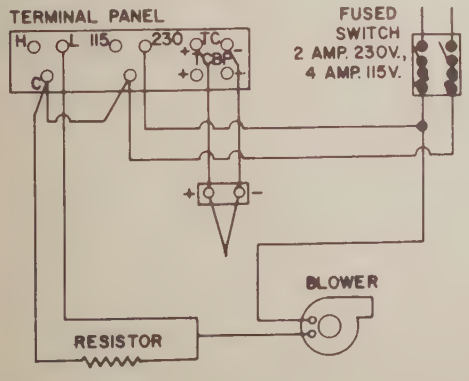
④ 4-WIRE CONTROL MOTOR-VALVE



HONEYWELL MODEL M604B

TWO SPEED BLOWER MOTOR CONTROL FOR HIGH-LOW HEAT CONTROL

⑤



NOTES:

1. THERMOCOUPLE BREAK PROTECTION (TCBP) DOES NOT HAVE TO BE USED. IF USED, WIRE AS SHOWN IN FIG. 1 ABOVE. IF NOT USED, DO NOT CONNECT.
2. ALL DIAGRAMS ABOVE SHOW WIRING FOR 230V. IF 115V. ARE USED USE TERMINAL 115 INSTEAD OF 230.
3. IN ALL CASES INSTRUMENT AND LOAD MAY BE POWERED SEPARATELY WITH THE SAME OR DIFFERENT VOLTAGE. LOAD MAY BE 230V. WITH INSTRUMENT ON 115 V., ETC.
4. INSTRUMENT CONTACT RATING 4 AMP. AT 115V., 60 CYCLES OR 2 AMP. AT 230V., 60 CYCLES.
5. REMOVE SHIPPING JUMPER ON TERMINAL PANEL BEFORE USING.

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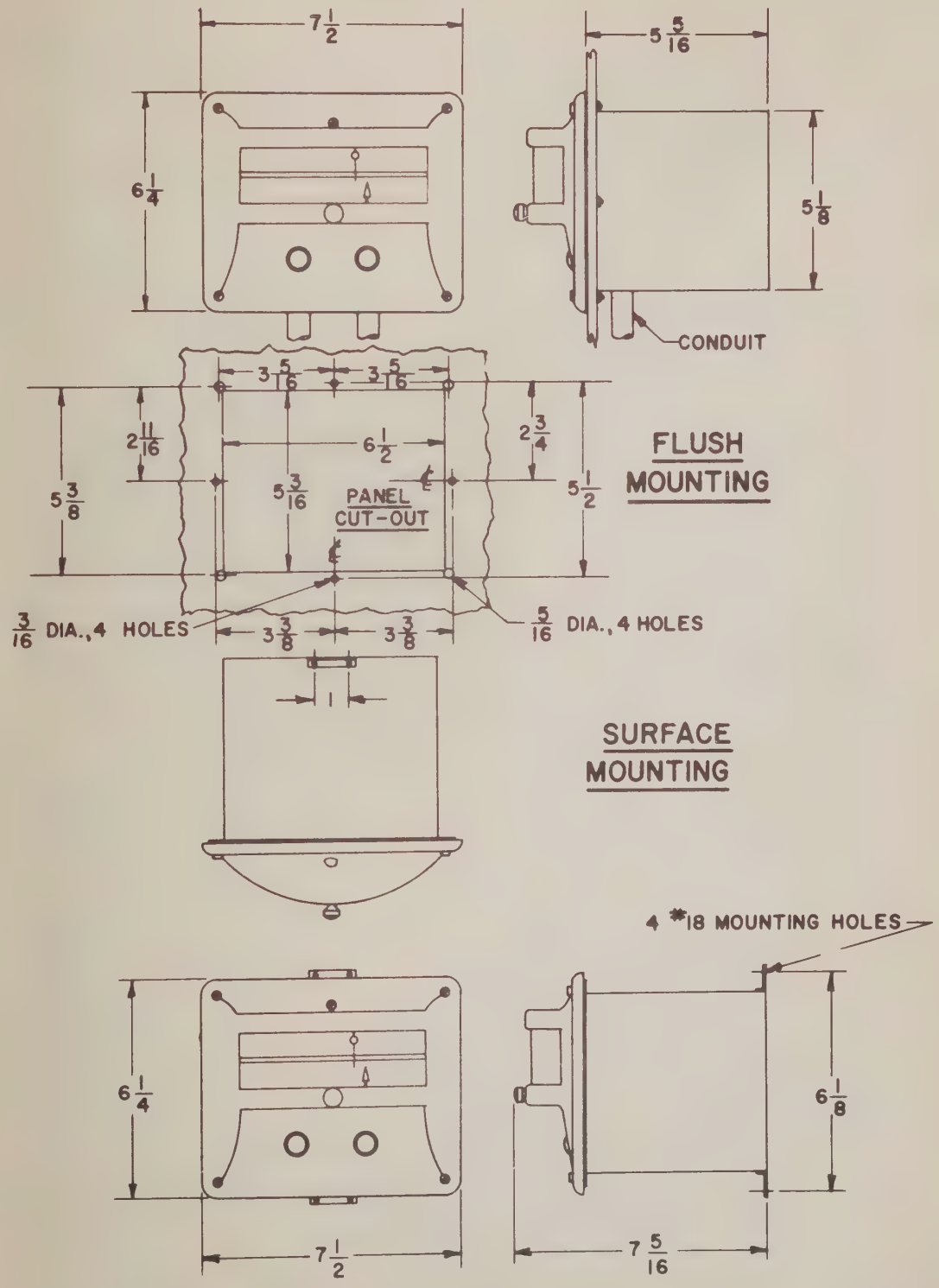
Mounting Dimensions

MODELS J, JL & JP



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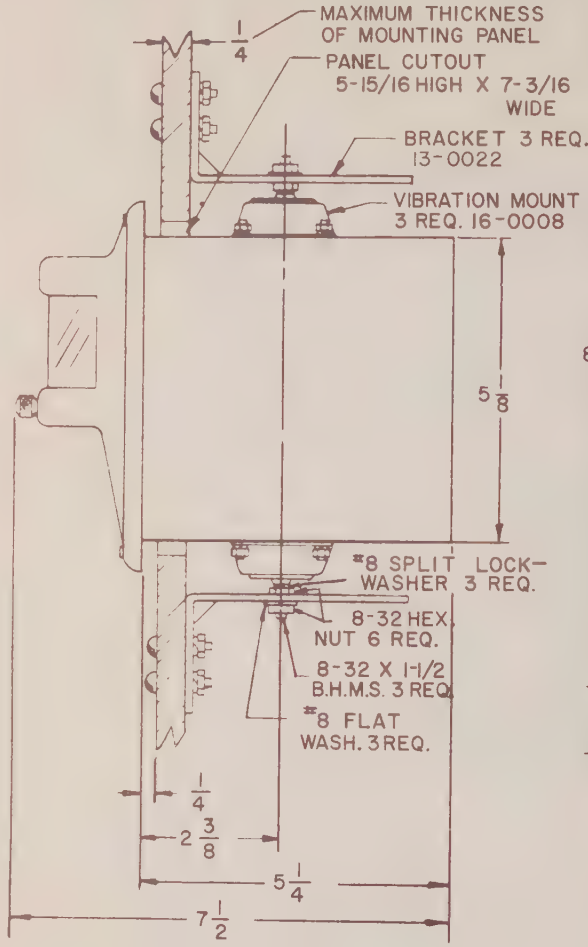
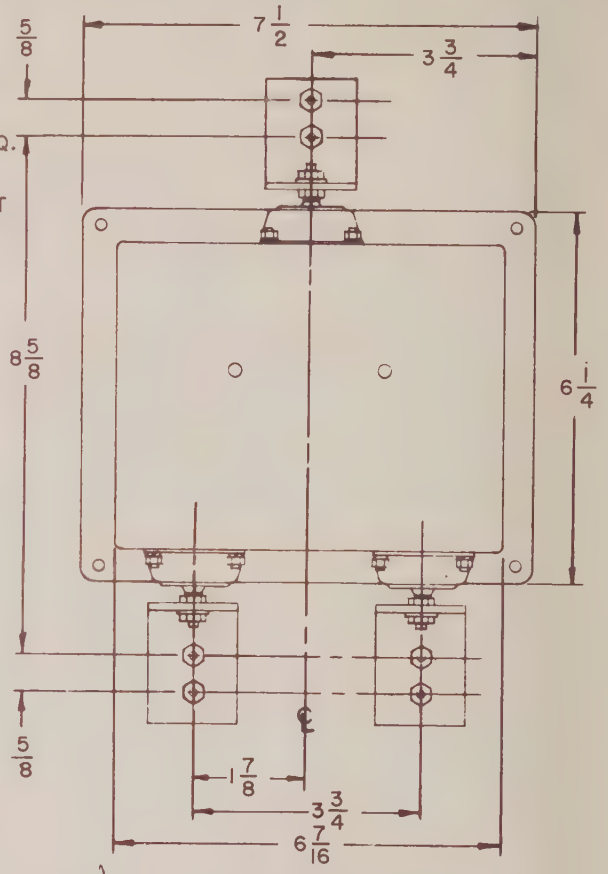
Vibration Mounting Dimensions

MODELS J, JL & JP



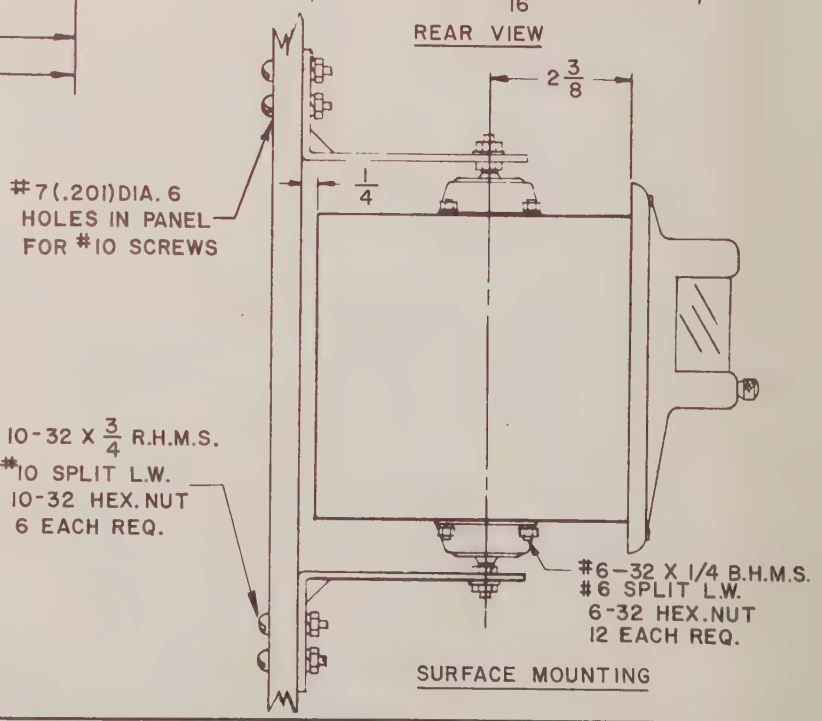
FLUSH MOUNTING



REAR VIEW

NOTES:

1. SPECIFY NO. AA-0021 FOR COMPLETE VIBRATION MTG. KIT.
2. USE A PIECE OF FLEXIBLE TUBING ON THE END OF EACH CONDUIT RUN TO INSTRUMENT. A MINIMUM OF 12 INCHES IS RECOMMENDED.



SURFACE MOUNTING

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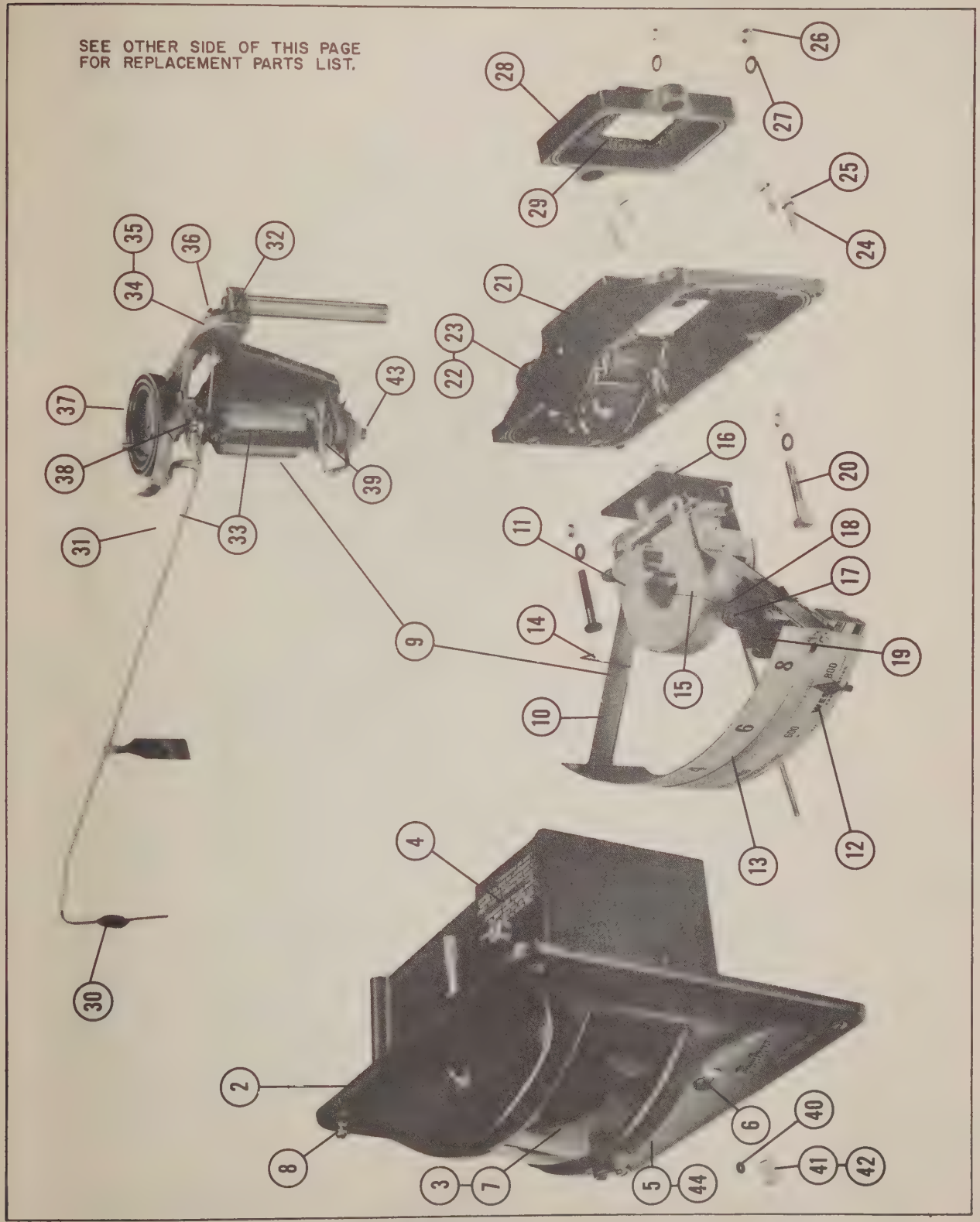
Indicator Assembly

MODELS J, JP, JSB SERIES, JT-2, JPT-2, JE & JEP



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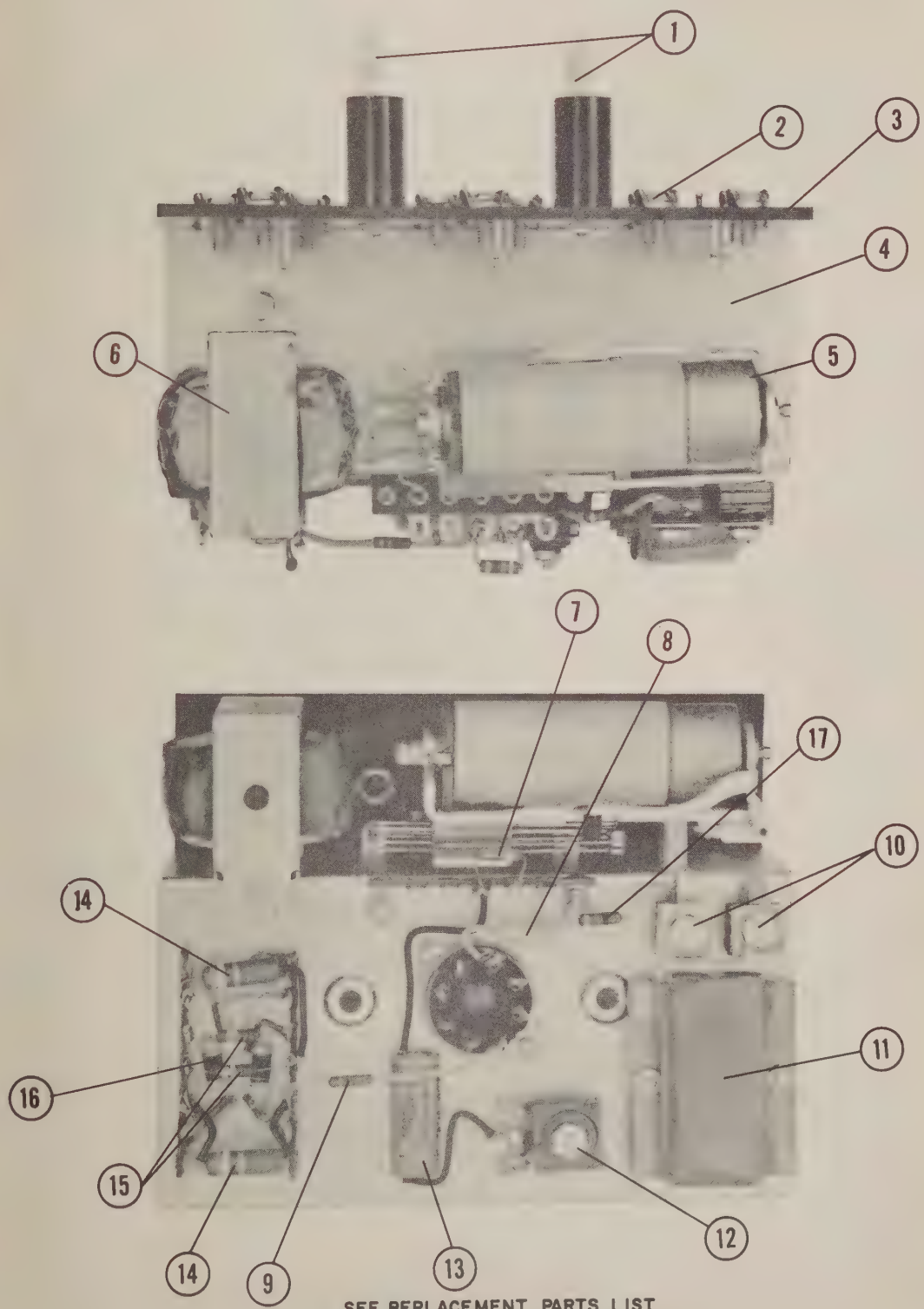
Parts List

MODELS J, JP, JSB SERIES, JT-2, JPT-2, JE & JEP

CODE	ORDERING NUMBER	DESCRIPTION	ASSEMBLY INCLUDES CODE NOS.	REQ'D. PER INSTRUMENT	PRICE EACH
1	JA-0001	COMPLETE INDICATOR ASSEMBLY. . . . . (All Except Model JSB Series)	ALL	1	$90.00
1	JSBA-0005	COMPLETE INDICATOR ASSEMBLY. . . . . (Model JSB Series Only)	ALL	1	90.00
2	JA-0048	COMPLETE COVER ASSEMBLY . . . . . (All Except Model JSB Series)	3, 5, 6, 7	1	20.00
2	JSBA-0037	COMPLETE COVER ASSEMBLY . . . . . (Model JSB Series Only)	3, 6, 7, 44	1	20.00
3	12-0008	RETAINER SPRING FOR WINDOW		2	.25
4	JA-0041	ACCESS COVER ASSEMBLY.		1	3.00
5	16-0001	RUBY JEWEL (All Except JSB Series)		1	.30
6	16-0002	GREEN JEWEL		1	.30
7	34-0002	GLASS WINDOW		1	1.00
8	2-0021	CAPTIVE COVER SCREWS		4	.10
9	JA-0003	MOVEMENT ASSEMBLY. . . . . (All Except Model JSB Series)	10, 31, 32	1	55.00
9	JSBA-0039	MOVEMENT ASSEMBLY. . . . . (Model JSB Series Only)	10, 31, 32	1	55.00
10	JA-0004	COMPLETE MAGNET ASSEMBLY . . . . . (All Except Model JSB Series)	11, 12, 13, 15	1	35.00
10	JSBA-0038	COMPLETE MAGNET ASSEMBLY . . . . . (Model JSB Series Only)	11, 12, 13, 15	1	35.00
11	JA-0005	MAGNET AND SETTING ARM ASSEMBLY . . .	14, 16	1	30.00
12	JA-0014	SCALE AND SCALE PAN ASSEMBLY. . . . . (Specify Scale Range)		1	2.50
13	73-0020	MIRROR STRIP.		1	.20
14	8-0001	LOWER POINTER STOP.		1	.20
15	8-0002	HIGH POINTER STOP		1	.20
16	JA-0009	REAR PANEL AND PRONG ASSEMBLY		1	5.00
17	25-0002	LIGHT SOURCE		1	.15
18	JA-0055	LIGHT SOURCE REFLECTOR.		1	.20
19	25-0008	PHOTO CELL		1	8.50
20	2-0019	METER MOVEMENT MOUNTING SCREWS. . .		2	.10
21	JA-0043	PRIMARY REAR COMPLETE.		1	6.50
22	JA-0045	CALIBRATING SPOOL (Specify Scale Range). .		1	2.00
23	18-0027	CALIBRATING SPOOL COVER		1	.25
24	#6-40 Filister Hd. 1/2" Long	PRIMARY REAR MOUNTING SCREW.		4	.10
25	4-0055	LOCKWASHER FOR PRIMARY REAR MOUNTING SCREW		4	.10
26	3-0032	METER MOVEMENT MOUNTING SCREW NUT.		2	.10
27	4-0003	METER MOVEMENT MOUNTING SCREW WASHER.		2	.10
28	JA-0046	SECONDARY REAR COMPLETE	29	1	3.50
29	33-0021	SECONDARY REAR FLAT GASKET.		1	.25
30	13-0015	GREEN TARGET.		1	.10
31	JA-0056	MOVING ELEMENT AND BRACKET ASSEMBLY (Specify Scale Range).	33, 34, 37	1	17.50
32	6-0019	RETAINER CLIP FOR HOLDING BRACKET ASSEMBLY TO MAGNET ASSEMBLY. . . .		2	.10
33	JA-0015	MOVING ELEMENT ASSEMBLY	30, 36, 38, 39	1	10.00
34	JA-0016	BRACKET ASSEMBLY.	35	1	6.00
35	JA-0017	BRACKET ONLY WITH CORE		1	3.50
36	10-0025	TAIL WEIGHT		1	.15
37	AS REQ'D.	COMPENSATOR (Specify Scale Range)		1	1.00
38	10-0040	PIVOT		2	.25
39	12-0011	HAIRSPRING.		2	.50
40	18-0019	"O"RING		1	.15
41	10-0034	SETTING KNOB		1	.50
42	2-0107	SET SCREW FOR SETTING KNOB		1	.10
43	JA-0026	JEWEL SCREW ASSEMBLY.		2	1.00
44	6-0008	PLUG BOTTOM (JSB Series Only)		1	.15

Chassis Assembly

MODELS JP & JEP



SEE REPLACEMENT PARTS LIST
ON OTHER SIDE OF THIS PAGE

CAUTION: DO NOT USE THIS FOR WIRING. SEE INTERNAL WIRING DIAGRAMS

Parts List

MODELS JP & JEP CHASSIS ASSEMBLY

Complete Chassis Assembly

Ordering No. JPA-0004 ..... **$110.00**

PARTS BREAKDOWN

CODE NO.	ORDERING NO.	DESCRIPTION	REQ. PER INSTRUMENT	PRICE EACH
1	25-0002	Pilot Light Type 44	2	$ .15
2	1-083207-A12	#8-32x7/16" Binder Hd. Screws	10	.10
3	11-0039	Terminal Panel	1	5.00
4	JA-0021	Chassis Plate, Socket and Terminal Strip Assembly	1	3.00
5	21-0002	Relay	1	10.00
6	27-0001	Transformer	1	5.00
7	Factory Replace Only	Feed Back Resistor	1	–
8	22-0065	Capacitor, Controlled Leakage	1 •	.50
9	Factory Replace Only	Bias Resistor	2	–
10	26-0001A	Rectifier, 20 MA. 130V.	2	1.50
11	JA-0023	Reactor Assembly	1	10.00
12	26-0011A	Rectifier, 75 MA. 26 V.	1	1.75
13	22-0001	Capacitor, 2 MFD. 250 WV.D.C.	1	1.00
14	23-0039	Resistor, 3900 OHMS (RI)	2	.20
15	23-0001	Resistor TCBP, .12 Meg. Ohms (R2)	2	.15
16	JPA-0002	Thermistor-heater Assembly	2	2.00
17	23-0010	Limiting Resistor (R-3)	1	.15

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WEST Instrument CORPORATION

INSTRUCTIONS

CAT. NO. 6A426 THERMOSTATS

DESCRIPTION

GENERAL

Cat. No. 6A426 thermostat manufactured for General Electric is a general-purpose switching device, which consists of two major parts: a temperature-sensitive bulb, connected by a capillary to a diaphragm; and a double-pole, single-throw, snap-action switching mechanism. The normally closed contacts of the switching mechanism can be set to open within the range of the particular thermostat. See Table 1.

On thermostats with a type N case (Fig. 1) the setting is made by means of the knob located on the cover of the switching mechanism. This temperature setting is made with a screwdriver on thermostats with a type S case (Fig. 2) by inserting it through the opening provided in the front of the case.

APPLICATION DATA

The 6A426 thermostat has the electrical rating shown in Table 2. For connection diagrams refer to Fig. 3.

If it is desired to control an electrical load larger than the thermostat can handle, the thermostat can be used to operate a G-E magnetic switch or relay of suitable size. This device will then carry the main power load, while the thermostat controls only the operating coil.

PRINCIPLES OF OPERATION

GENERAL

The thermostat is actuated by the temperature of the material or atmosphere into which the tempera-

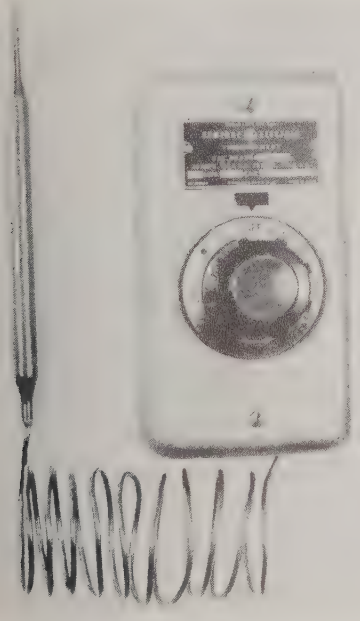


Fig. 1. 6A426 Thermostat with Type N Case

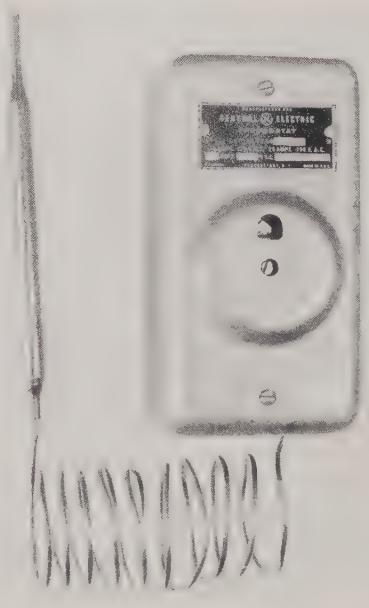


Fig. 2. 6A426 Thermostat with Type S Case

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

TABLE 1

CATALOG NUMBER	TEMPERATURE RANGE	MAX. TEMPERATURE DIFFERENTIAL	BULB SIZE	CAPILLARY LENGTH	TYPE CASE
6A426G1	30–110 F	6.5 F	⅜ x 6½ in.	24 in.	S
6A426G2	30–110 F	6.5 F	⅜ x 6½ in.	60 in.	S
6A426G3	30–110 F	6.5 F	⅜ x 6½ in.	120 in.	S
6A426G4	60–250 F	10.0 F	⅜ x 4½ in.	24 in.	N
6A426G5	60–250 F	10.0 F	⅜ x 4½ in.	60 in.	N
6A426G6	60–250 F	10.0 F	⅜ x 4½ in.	120 in.	N
6A426G7	200–550 F	15.0 F	3/16 x 13 in.	24 in.	N
6A426G8	200–550 F	15.0 F	3/16 x 13 in.	60 in.	N
6A426G9	300–700 F	15.0 F	⅜ x 3¾ in.	24 in.	N
6A426G10	300–700 F	15.0 F	⅜ x 3¾ in.	60 in.	N
6A426G11	300–700 F	15.0 F	3/16 x 13 in.	24 in.	N
6A426G12	300–700 F	15.0 F	3/16 x 13 in.	60 in.	N

TABLE 2

MAXIMUM LOAD

AC CURRENT						DC CURRENT		
SINGLE PHASE		TWO-ELEMENT CIRCUIT		THREE PHASE		VOLTS	AMPERES	CAPACITOR*
Volts	Amperes	Volts	Amperes	Volts	Amperes			
125	35	125	35	--	--	115	25	1 mfd
						115	20	.5 mfd
250	25	250	25	250	25	230	15	1 mfd
						230	10	.5 mfd

* This capacitor should be obtained locally by the purchaser. It should be connected across the contacts of the switching mechanism on each pole.

ture-sensitive bulb is inserted. If this material is of such a nature that it will chemically attack the bulb or capillary they should be protected by a tube and well.

The device to be controlled is wired through the contacts of the switching mechanism. When the temperature-sensitive bulb reaches the set temperature of the thermostat the liquid in the bulb and capillary has expanded sufficiently to cause the diaphragm, to actuate the switching mechanism, and open the normally-closed contacts. A drop in temperature acts in a reverse manner causing the contacts to close.

TEMPERATURE DIFFERENTIAL

The degrees Farenheit between the point at which the contacts open and the point at which they close, regardless of setting, is the temperature differential of the thermostat. It will vary slightly with each installation dependent on the location and size of the bulb, and temperature range of the particular device. The temperature differentials shown by Table 1 were obtained with standard bulbs immersed in liquid changing 1F every three minutes.

MAXIMUM PRESSURE

The bulbs will not be damaged by external pressures up to 400 pounds per square inch.

MAXIMUM TEMPERATURE

Excessive temperature can cause permanent damage to the device. A thermostat should not be operated continuously at a temperature higher than the highest

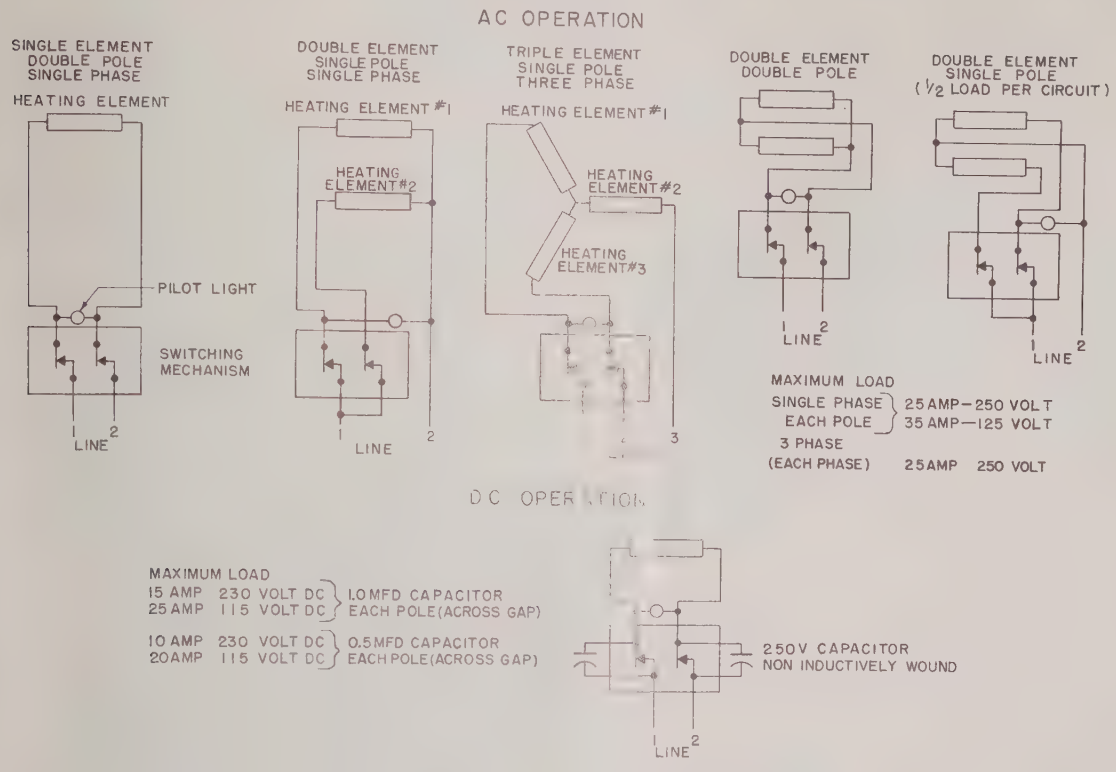

AC OPERATION
SINGLE ELEMENT DOUBLE POLE SINGLE PHASE
HEATING ELEMENT
PILOT LIGHT
SWITCHING MECHANISM
LINE
DOUBLE ELEMENT SINGLE POLE SINGLE PHASE
HEATING ELEMENT #1
HEATING ELEMENT #2
TRIPLE ELEMENT SINGLE POLE THREE PHASE
HEATING ELEMENT #3
DOUBLE ELEMENT DOUBLE POLE
DOUBLE ELEMENT SINGLE POLE (1/2 LOAD PER CIRCUIT)
MAXIMUM LOAD
SINGLE PHASE EACH POLE 25 AMP—250 VOLT 35 AMP—125 VOLT
3 PHASE (EACH PHASE) 25 AMP 250 VOLT
DC OPERATION
MAXIMUM LOAD
15 AMP 230 VOLT DC 115 VOLT DC 1.0 MFD CAPACITOR EACH POLE (ACROSS GAP)
10 AMP 230 VOLT DC 20 AMP 115 VOLT DC 0.5 MFD CAPACITOR EACH POLE (ACROSS GAP)
250 V CAPACITOR NON INDUCTIVELY WOUND

Fig. 3. Connection Diagrams for 6A426 Thermostat

marking on the dial. The maximum safe temperature to which it can be occasionally subjected is shown in Table 3. This temperature should never be exceeded.

TABLE 3

TEMPERATURE RANGE	MAXIMUM SAFE TEMP.
30–110 F	150 F
60–250 F	300 F
200–550 F	575 F
300–700 F	725 F

INSTALLATION

Immediately upon receipt of the thermostat, examine the equipment for any damage that might have been sustained in transit. If injury or rough handling is evident, a damage claim should be filed immediately with the transportation company, and the nearest General Electric Sales Office should be notified promptly.

LOCATION OF SWITCHING MECHANISM

The switching mechanism of the 6A426 thermostat is a device sensitive to vibration or jarring. For this reason it should be mounted on a solid surface free from external shocks or movement which might adversely affect its operation. It should be located in an area which is free from dust or moisture. The location should have a normal temperature of about 70 F and should never exceed 200 F. The switching mechanism must be protected from corrosive or explosive atmosphere.

LOCATION OF TEMPERATURE-SENSITIVE BULB

The temperature-sensitive bulb should be located in a position where the heat changes repeat uniformly over a period of time. By carefully selecting the best location for the bulb the thermostat will operate at a much lower temperature differential. In general the sensitivity of a thermostat is determined by this differential. It is equally important however, to see that the bulb has good thermal contact with the controlled material and that the bulb is installed at a point which represents the average temperature.

The bulb must be installed so that the temperature of the bulb is not exceeded in the capillary. Since the

bulb and capillary are metal, they should not be exposed to harmful acids or corrosive atmospheres or substances. If such an installation is necessary the bulb and capillary must be protected with a well and tube.

The proper material for the protective well and tube varies with almost every corrosive agent; therefore, it is advisable to procure them from the manufacturers of the container holding the corrosive material.

MOUNTING THE SWITCHING MECHANISM

The Switching Mechanism Must Be Mounted in a Vertical Position.

1. Remove the temperature-setting knob.
2. Remove the cover by removing the two screws on the front.
   This will expose the three holes in the base for mounting screws.

   CAUTION — Any further disassembly will change the calibration made at the factory, and must be avoided.
3. Fasten the switching mechanism firmly to a solid support.

NOTE: Do not mount on the same panel as a large magnetic switch or other devices which might jar the unit and cause it to function improperly.

4. Make the necessary electric connections as shown in Fig. 3. Pilot lights, if required, may be installed as shown.
5. Replace the cover and knob.

MOUNTING THE TEMPERATURE-SENSITIVE BULB

The bulb must so be installed as to have good thermal contact with the working medium. The bulb may be installed in any position without affecting the operation of the mechanism. When it is necessary to install the bulb in a well, to protect it from corrosive material or atmosphere, it is suggested that the well be filled with some heat transfer medium, such as oil.

The capillary may be coiled or bent to a minimum inside radius of three-eights of an inch. **Care Must Be Taken Not To Kink the Capillary When Forming.**

The 3/16 x 13 inch bulbs can be formed to a minimum inside radius of five inches.

STUFFING BOX

When it is necessary to install the bulb in a container holding a liquid, a stuffing box assembly (Fig. 4) is available which can be used to provide a tight seal where the capillary passes through the container wall.

This assembly consists of six slotted washers, graphite packing, and female/male adaptors.

The fitting is screwed into a hole in the container, which is tapped with a three-eighths standard pipe thread. The packing and washers are placed around the capillary with the packing in the center and the top nut tightened down to provide a tight seal.

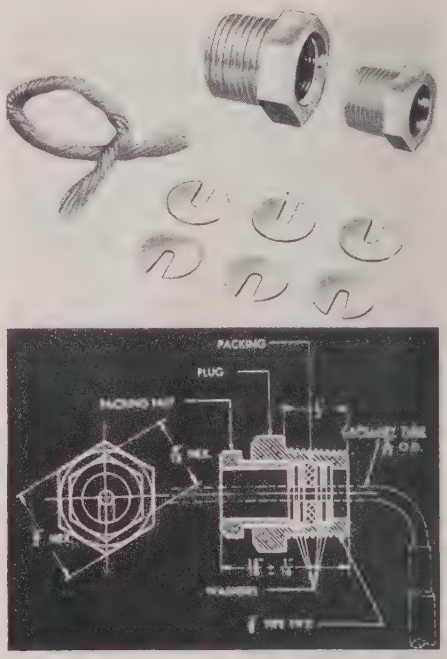


Fig. 4. Cat. No. 6A440 Stuffing Box Assembly

REPLACEMENT PARTS

Since the delicate calibration of these thermostats might be affected by repairs made without the necessary special tools, skill and equipment, damaged thermostats should be returned to the Industrial Heating Department of the General Electric Company where, if possible, repairs will be made. In the event that repair is impractical the customer will be notified and the thermostat may be exchanged or replaced.

INDUSTRIAL HEATING DEPARTMENT

GENERAL ELECTRIC

SHELBYVILLE, IND.

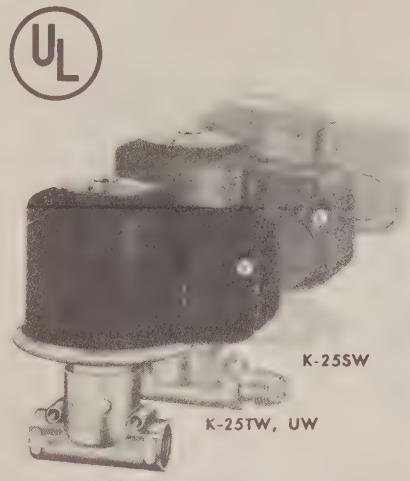
6 55 (10M)

SERVICE AND INSTALLATION

K-25 SOLENOID STOP VALVE

DESCRIPTION

K-25 Series solenoid operated refrigeration valves are normally closed. Direct acting metal ball and seat assure tight closing. The two-wire, Class "W", coil is supplied standard for long life on low temperature service or sweating conditions. Current failure or interruption will cause the valve to fail-safe in the closed position. Solenoid cover can be rotated 360° for easy installation. Explosion-proof models and standard No. 180 solenoid covers have 1/2" IPS conduit connection and 18" coil leads. Standard No. 225 solenoid has integral junction box with 1/2" knockout connections and 6" coil leads. Coil voltages are indicated in table. Brass body is rated at 300 psi (see table for maximum operating pressure differential), trim is non-magnetic stainless steel. Valves are usable with temperatures to +150°F. Valve bodies are made with three types of connections: pipe threads, flare fittings, and sweat fittings with sizes given as OD of the tube.



K-25 Explosion-proof

APPLICATION

Useable with all refrigerants *(Freons, Genetrons, Methyl Chloride, Sulphur Dioxide) except ammonia.

A variety of temperature control installations can be accomplished with these valves:

By-pass	Ice makers	Chilled water
Defrosting	Alcohols	Cooling tower
Suction line	Unloading	Brine
Hot gas service	Reverse cycle	Liquid line stop
Humidity control		

*See liquid and suction stop capacities - page 2.

OPERATION

K-25 Valves are held in the normally closed position by weight of the plunger assembly and fluid pressure on top of the valve ball.

The valve is opened by energizing the coil and magnetically lifting the plunger and allowing full flow by the valve ball.

De-energizing the coil permits the plunger and valve ball to return to the closed position.

K-25 SW • MAGNETIC STOP • SWEAT CONNECTION

Connection Inch	Port Inch	Solenoid Size	MOPD psi Refrig.	MOPD psi Liquid	CV Factor for Liquids	Liquid Stop ② Capacity in Tons Freon 12	Liquid Stop ② Capacity in Tons Freon 22	Suction Stop ④ Capacity in Tons Freon 12	Suction Stop ④ Capacity in Tons Freon 22	Ship Wt Lbs	Catalog Number ⑤ 115V/60	Catalog Number ⑤ 230V/60	Catalog Number ⑤ Dual Voltage 115/230/60
3/8 OD Tube	5/32	225 ⑥	250			1.95	3.00	.18	.24	2 1/2	K-25SW1442	K-25SW1444	K-25SW1445
1/2 OD Tube										2 3/4	K-25SW1462	K-25SW1464	K-25SW1465
3/8 OD Tube	7/32	225 ⑥	150			3.05	⑦	.28	.38	2 1/2	K-25SW1542	K-25SW1544	K-25SW1545
1/2 OD Tube										2 3/4	K-25SW1562	K-25SW1564	K-25SW1565

K-25 TW, UW • MAGNETIC STOP • FLARE TUBE CONNECTION

1/4 OD Tube	.100	180	150			.85	⑦	.06	.09	1 3/4	K-25TW1222	K-25TW1224	K-25TW1225
3/8 OD Tube	5/32	225 ⑥	250			1.95	3.00	.18	.24	2 1/2	K-25UW1442	K-25UW1444	K-25UW1445
	7/32		150			3.05	⑦	.28	.38		K-25UW1542	K-25UW1544	K-25UW1545

K-25 AW, EW • MAGNETIC STOP • PIPE CONNECTION

3/8 IPS	.100	180	150	125	.21	.85	⑦	.06	.09	1 3/4	K-25AW1232	K-25AW1234	K-25AW1235
	5/32	225	250	225	.58	1.95	3.00	.18	.24	2 1/2	K-25EW1432	K-25EW1434	K-25EW1435
	7/32	⑥	150	130	.90	3.05	⑦	.28	.38		K-25EW1532	K-25EW1534	K-25EW1535

① For hot gas or high temperature application, specify Class B coil. To order, substitute B for W in catalog number.

② Nominal ratings for liquid line solenoids are based on following pressure drops: Freon 12, 2 psi; Freon 22, 3 psi. For other pressure drops and refrigerant ratings see page 2.

④ Nominal ratings for suction line solenoid valves are based on 100°F saturated liquid entering evaporator, 40°F evaporator, 50°F vapor entering valve, and 1 psi pressure drop through valve. For other pressure drops, and refrigerant ratings, and evaporator temperatures, see page 2.

⑤ Slight extra charge for K-25 valve with factory-installed strainer No. 102592. To order, add letter E to catalog number, e.g., K-25AW1232E.

⑤ For 24/60 operation, substitute 1 for 2 in last digit of catalog number, e.g., for K-25AW1232 for 24V operation, specify K-25AW1231.

⑥ Explosion-proof housing available.

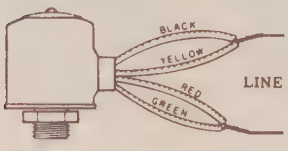
⑦ Valve not suitable for F-22 liquid service - low pressure rating.

Order this form by:
SDI-K25-1
Effective 1-15-56
Supersedes SDI-20-1,
Dated 8-1-51

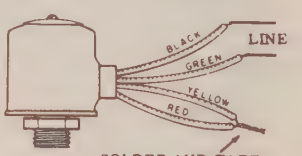
INSTALLATION

1. Blow dirt from all piping.
2. Solenoid must be in the vertical position.
3. Do not use solenoid for turning or carrying.
4. Use thread seal sparingly on male threads only.
5. Be sure arrow on body follows flow.
6. Use wrench on body flats at end being joined.
7. Use a General Controls SY strainer up-stream of valve to insure trouble-free operation.
8. Electrical wiring must comply to local codes.
9. Wire limit controls in hot side of circuit.
10. Use sleeves as indicated for side wall mounting to prevent solenoid damage by valve slippage or inadequate clearance.
11. Connections for Dual Voltage Coils:

115 VOLT OPERATION



230 VOLT OPERATION



SOLDER AND TAPE THIS CONNECTION

MULTIPLIER FACTOR FOR SAME PRESSURE DROP

②Use With Suction Line Flow Only

Evaporator Temperature °F	Freon-22 Pressure Drop - psi 1	2	4	Methyl Cloride Pressure Drop - psi 1	2	4
-40	1.61	1.71	1.98	1.82	1.77	1.77
-10	1.51	1.53	1.56	1.76	1.75	1.70
20	1.49	1.49	1.50	1.71	1.71	1.70
40	1.45	1.46	1.46	1.66	1.64	1.61

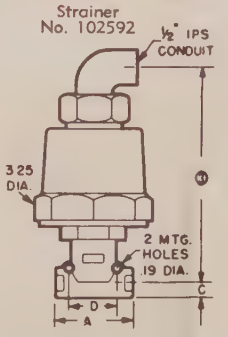
①Use With Liquid Flow Only

Freon-22 Genetron 141	1.26
Methyl Chloride	2.48
Sulphur Dioxide	2.80
Ammonia	6.30
Freon-11	1.44
Freon-114	.90

④REPLACEMENT COIL NUMBERS

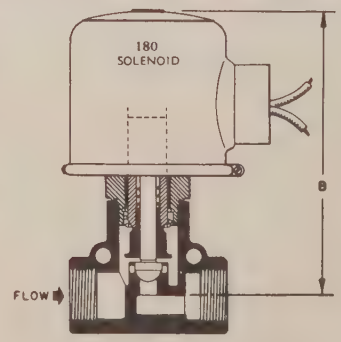
Solenoid & Voltage	Solenoid & Voltage
C180AW11560A18	C225AW11560A18
C180AW23060A18	C225AW23060A18
C180AW115/23060A18	C225AW115/23060A18

Strainer No. 102592

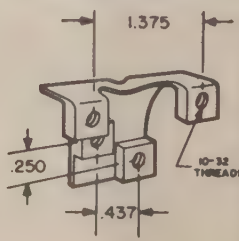


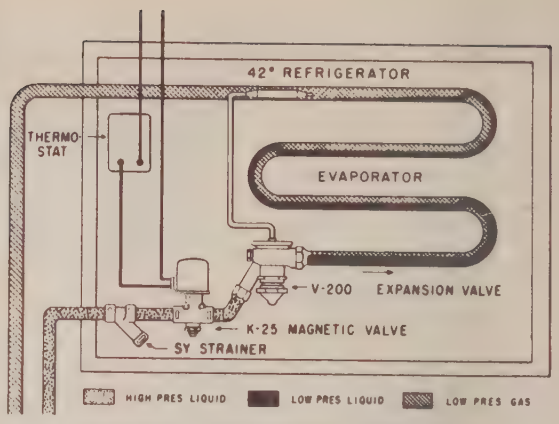
Size	Solenoid ④	Dimension - Inch A	B	C	D
3/8 OD Sweat	225	3.13	4.39	.44	1.375
1/2 OD Sweat		3.44			
1/4 OD Flare	180	3.38	3.72		
3/8 OD Flare	225	3.63	4.39		
3/8 IPS	180	2.19	3.72		
3/8 IPS	225		4.39		

④Add 2" to dim. B for No. 225 Ex. Prs.



UNIVERSAL MOUNTING BRACKET NO. 102808





Schematic Refrigeration Installation

SERVICE SUGGESTIONS

When valve fails to function correctly:

POSSIBLE CAUSE	REMEDY
Fuse blown, short in circuit, limit or other controls open.	Check circuit and operation of control system.
Limit control in grounded side of circuit.	Wire controls in hot side of circuit.
Coil shorted - burned out-wrong voltage.	Replace with correct coil.
Flow not to top of valve seat.	Arrow on body must follow flow.
Foreign matter restricting valve.	Clean mechanical parts with solvent.
Bent or damaged plunger tube, binding plunger	Replace plunger and plunger tube.

CAPACITY TABLES

Suction Line Capacity in Btu/Hour

Port Inch	Solenoid Size	Temperature °F	Pressure Drop psi - Freon-12 ② .5	1	2	4
7/32	225	-40	690	966	1230	1360
		-10	1150	1590	2185	2850
		20	1725	2390	3360	4600
		40	2250	3130	4300	5980

Liquid Flow in Tons

Port Inch	Pressure Drop psi - Freon-12① 1	2	3	4	5	6	7	8	10
.1	.60	.85	1.04	1.20	1.34	1.47	1.58	1.69	1.89
5/32	1.38	1.95	2.39	2.76	3.08	3.38	3.86	3.91	4.36
7/32	2.15	3.05	3.74	4.32	4.83	5.28	5.72	6.10	6.82

GENERAL CONTROLS
GLENDALE 1, CALIFORNIA
IRON MOUNTAIN, MICH.
BURBANK, CALIFORNIA
SKOKIE, ILLINOIS
GUELPH, ONTARIO

FACTORY BRANCHES

- ATLANTA
- BALTIMORE 24
- BOSTON 59
- BUFFALO 23
- CHATTANOOGA 4
- CHICAGO
- CINCINNATI 2
- CLEVELAND 3
- COLUMBUS 12
- DALLAS 7
- DENVER 4
- DES MOINES 11
- DETROIT 27
- GLENDALE 1
- HARTFORD
- HOUSTON 6
- INDIANAPOLIS 22
- IRON MOUNTAIN
- KANSAS CITY 8
- LONG ISLAND CITY 1
- LOS ANGELES
- MILWAUKEE 15
- MINNEAPOLIS 26
- NEW ORLEANS 15
- NEW YORK
- OMAHA 2
- PHILADELPHIA 4
- PHOENIX
- PITTSBURGH 22
- PORTLAND 14
- ST. LOUIS 10
- SALT LAKE CITY 1
- SAN FRANCISCO 7
- SEATTLE 9
- SKOKIE
- SYRACUSE 2
- TAMPA
- TULSA 20
- WICHITA 2

Canad
- GUELP
- MONT
- TORO
- WINN
- VANC

Distributors in principal cities

WARRANTY ALL PRODUCTS OF THE COMPANY ARE SOLD AND ALL SERVICES OF THE COMPANY ARE OFFERED SUBJECT TO THE COMPANY'S WARRANTY AND TERMS AND CONDITIONS OF SALE, COPIES OF WHICH WILL BE FURNISHE

INSTALLATION AND OPERATION INSTRUCTIONS

SERIES 270-271

FORM 999-579-9

SERIES 270-271 SINGLE POLE CONTROLS

for pressure and temperature service

APPLICATION

Penn Series 270-271 Single Pole Controls incorporate a *load-carrying*, single throw contact structure which provides direct control of A.C. motors within the control rating (see Electrical Rating chart). All controls incorporate a visible calibrated scale which indicates *directly* both cut-in and cut-out settings.

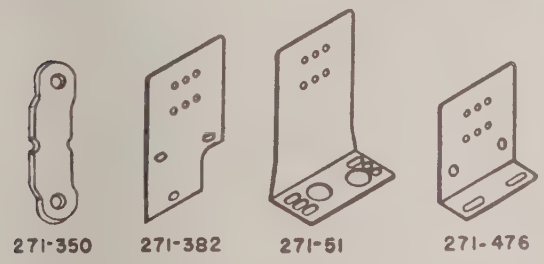
Available in either CLOSE high — OPEN low . . . or . . . OPEN high — CLOSE low actions for heating or refrigeration applications. Controls for ammonia refrigerant must be supplied with stainless steel bellows in steel cup.

ADJUSTMENTS

Should it be necessary to reset this control for your particular requirements, this can be done quickly and easily. See illustrations Figures 7 and 8, for adjusting instructions.

MOUNTING

Universal mounting bracket regularly supplied on pressure controls (Part No. 271-51 — Fig. 2). Strap-on bracket (No. 271-350) supplied on temperature controls. Controls may be mounted in any position. Controls may also be mounted to wall surface or panel board by two mounting holes provided in the back of the case. Other mounting brackets (Part No. 271-382 and 271-476) may be supplied on controls as specified by original equipment customers.



271-350 271-382 271-51 271-476

Fig. 2 — Standard Mounting Brackets.

WIRING

All wiring should conform to the National Electrical Code and local regulations. For maximum electrical rating of control, see electrical rating table.

ELECTRICAL RATING

MOTOR RATINGS	120 V.	208 V.	240 V.
A.C. Full Load Amps.	16	11.5	10
A.C. Locked Rotor Amps.	96	69	60
Non-Inductive Amps.	16	11.5	10
Pilot Duty — 125 VA. 120 to 600 V. A.C. 57.5 VA. 120 to 600 V. D.C.			

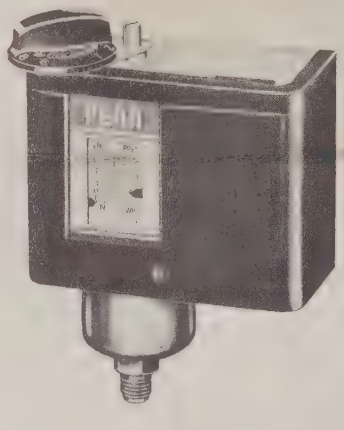


Fig. 1 — Exterior view of single function pressure control, Style 5.

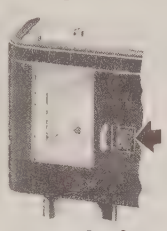


Fig. 3

MANUAL RESET AND "OFF" LEVERS

Manual lever shown in Fig. 3, left, when supplied on single unit controls (temperature or low side pressure) provides three positions . . . "OFF" "AUTOMATIC" and "MANUAL START."

On independent high pressure cut-out models, lever acts as manual reset mechanism only.

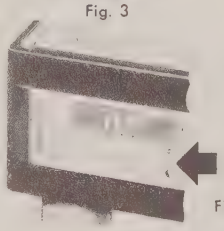


Fig. 4

If lockout is supplied on safety cut-out mechanism of "dual" controls (Fig. 4, left), lever provides for manual reset after operation of high pressure cut-out.

Fig. 5

Where it is desirable for the user to increase or decrease the DIFFERENTIAL ONLY, external adjusting knob is supplied on differential screw as shown in Fig. 5. Knob is provided with stops and factory assembled to permit change only within specified limits.

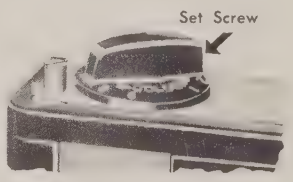


Fig. 6

External adjusting knob may be placed on range screw, as shown in Fig. 6, where it is necessary for the user to raise or lower both CUT-IN and CUT-OUT points (differential remains constant). Knob is provided with stops and factory assembled to permit adjustments within specified limits.

NOTE: — Knob is usually factory assembled in either position as shown in Figs. 5 or 6 above, depending upon specifications of original buyer. However, knob may be changed in the field from the differential to the range screw or visa versa by loosening set screw and removing knob and indicator plate and reversing their positions. Assuming that knob is factory assembled on range (Fig. 6) and set to limit adjustment to 10° F. on a temperature control, this adjustment will become approximately 5° F. if knob is placed on differential (Fig. 5). On pressure controls this same ratio will apply on basis of pressure in pounds per square inch.

ADJUSTMENTS

PRESSURE OR TEMPERATURE CONTROLS . . . Contacts close high; open low.

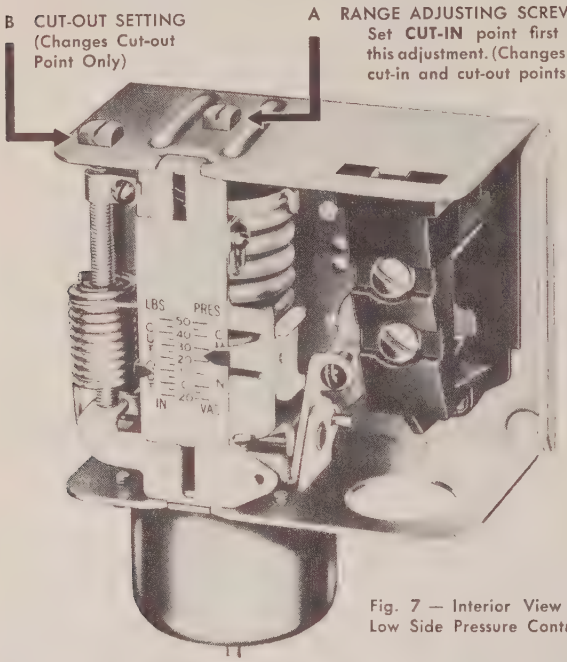

B CUT-OUT SETTING (Changes Cut-out Point Only)
A RANGE ADJUSTING SCREW Set CUT-IN point first with this adjustment. (Changes both cut-in and cut-out points.)
LBS
PRES
IN

Fig. 7 — Interior View of Low Side Pressure Control.

PRESSURE OR TEMPERATURE CONTROLS . . . Contacts open high; close low.

On models which **cut-out** on pressure or temperature increase, range adjusting screw "A" (See Fig. 7, above) raises or lowers *cut-out* point (this also raises or lowers cut-in point by a like amount). *Set cut-out point first with adjusting screw "A".* **Cut-in** (differential) adjusting screw "B" changes cut-in point only. Note: Before resetting controls equipped with external adjusting knob, remove knob and lockplate. Replace after resetting.

DUAL CONTROLS . . . Low Pressure or Temperature Operating and High Pressure Safety Cut-Out.

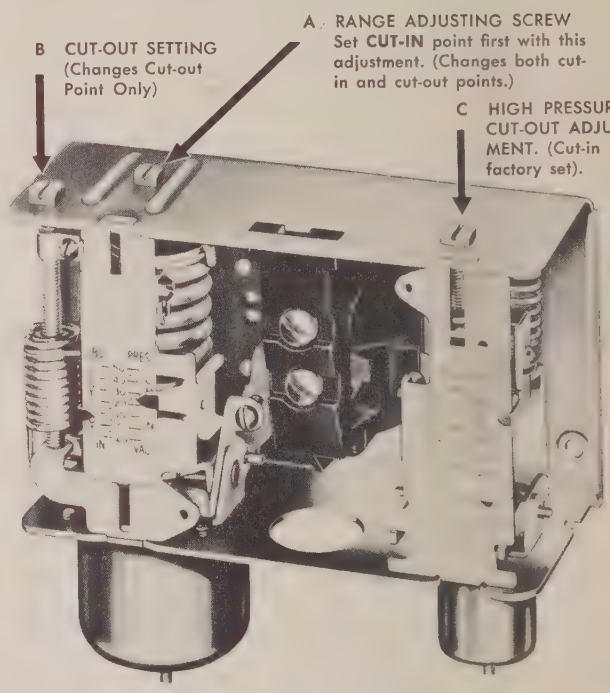

A RANGE ADJUSTING SCREW Set CUT-IN point first with this adjustment. (Changes both cut-in and cut-out points.)
B CUT-OUT SETTING (Changes Cut-out Point Only)
C HIGH PRESSURE CUT-OUT ADJUSTMENT. (Cut-in factory set).

Fig. 8 — Interior View of Dual Control.

GENERAL INSTRUCTIONS

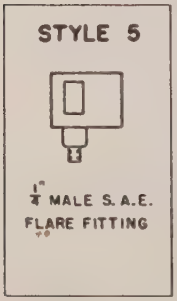
1. Avoid sharp bends or kinks in capillary tubing.
2. Be sure that pressure controls installed on ammonia systems are equipped with stainless steel bellows.
3. Purge all tubing and lines before connecting pressure controls.
4. Style 1 (for clamp contact or liquid immersion) . . . be sure bulb is securely clamped to evaporator coil or completely immersed in liquid.
5. Air temperature bulbs should be located where there is free air circulation. Make sure bulb does not contact wall surface.
6. Make sure that control is not installed on equipment to handle a load in excess of electrical rating.
7. Coil and secure excess capillary length to avoid vibration. Allow some slack in capillary to avoid "violin string" vibration which can cause tubing to break. Do not allow tubing to rub against metal surfaces where friction can damage capillary.

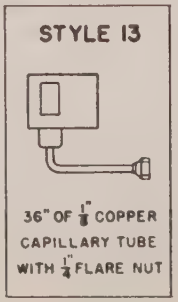
REPLACEMENT PARTS

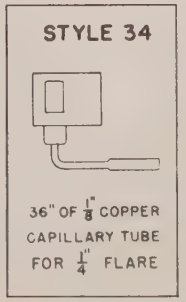
The contact unit and power element may be replaced in the field, if necessary. When ordering contact unit or power element be sure to give complete type and model number and temperature or pressure range as shown on the cover label inside cover of control. Controls requiring attention other than the contact unit or power element should be returned to the factory or the nearest Penn Authorized Service Station.

STANDARD PRESSURE AND TEMPERATURE ELEMENTS

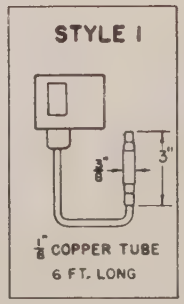
PRESSURE STYLES

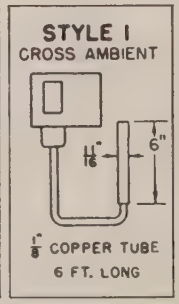


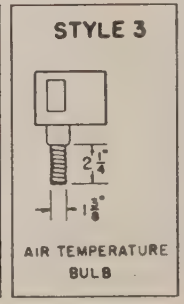


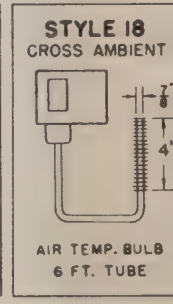


TEMPERATURE STYLES

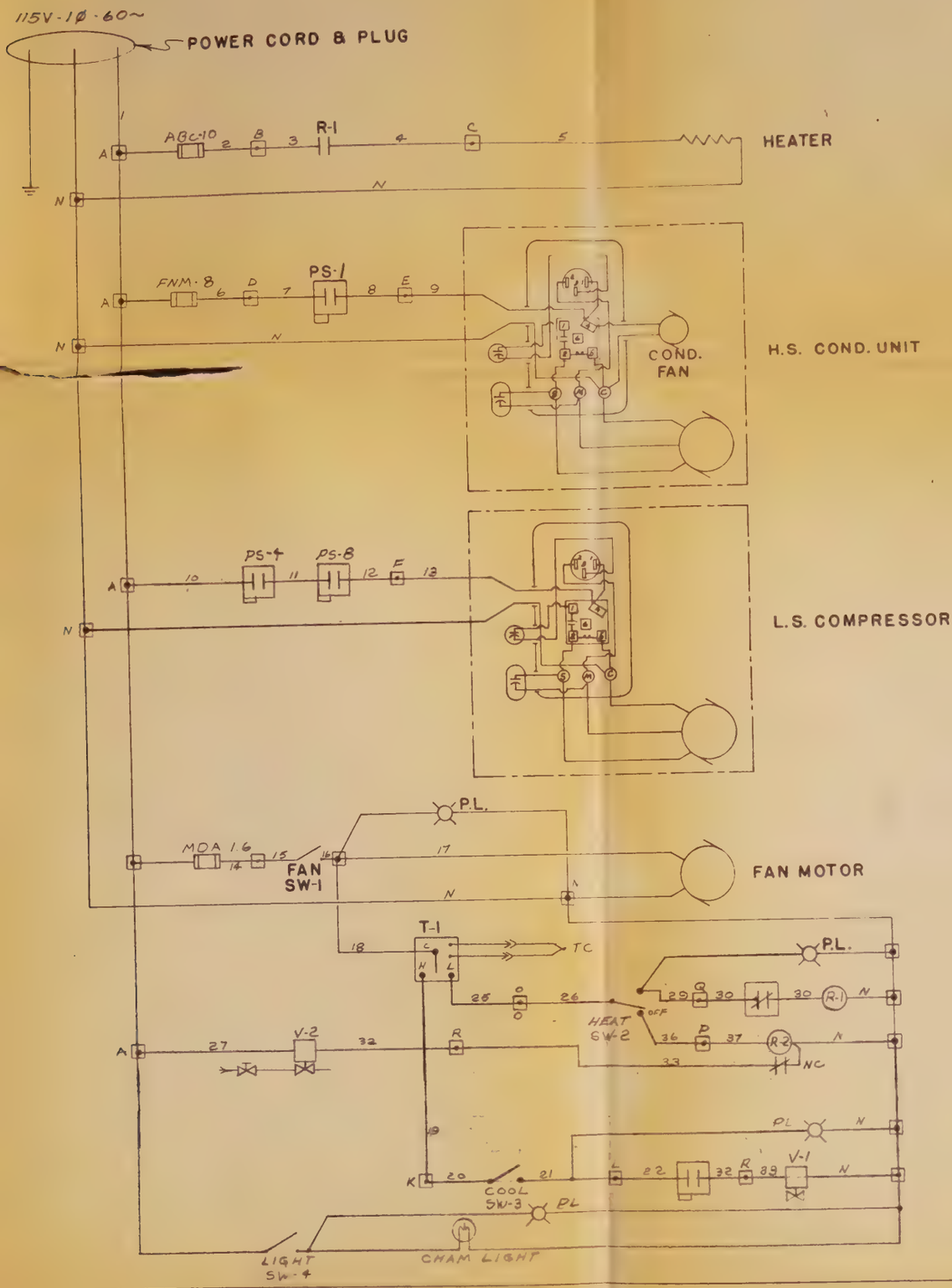








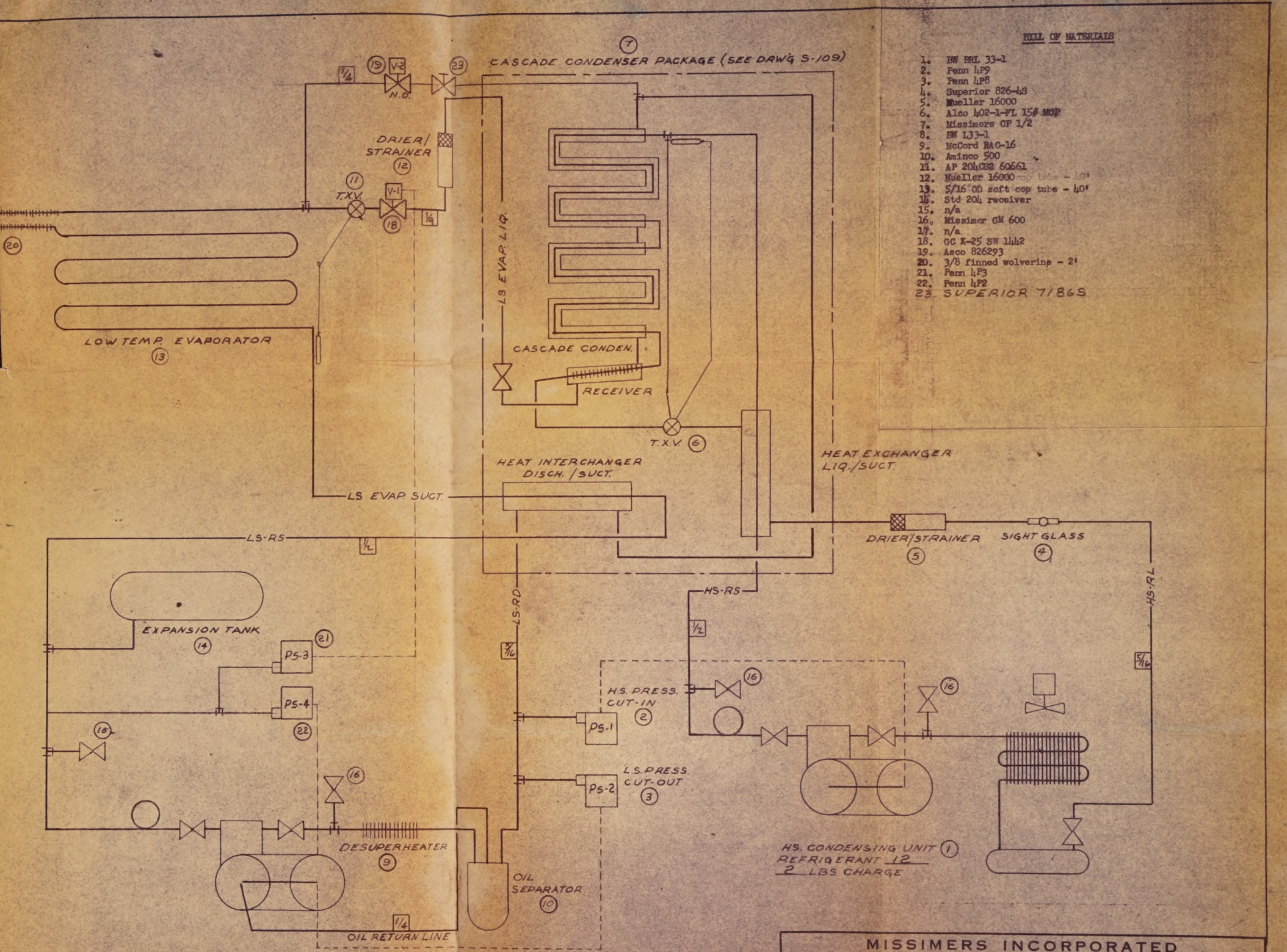
Litho in U.S.A.



BILL OF MATERIALS

SW-1,3,4 Toggle switches - CH 7500 K14 SPST
SW-2 Toggle switch - CH 9375-K7
PL Pilot lights - Dialco 803502
PS-1 HS cutin - Penn 4P9
PS-2 LS cutout - Penn 4P8
PS-3 LS suction limiter - Penn 4P3
PS-4 LS pump down - Penn 4P2
TS-1 Safety thermostat - GE 6A 4260
R-1 Heat contactor - Guardian 2210
R-2 N.C. relay - Guarding 2270
V-1 Liq solenoid valve - OC K-25SW 1442
V-2 Hot gas solenoid valve - Asco 826293
T-1 Temperature controller - West JP -100/600
HS cond unit - BW BRL 33-1
LS comp - BW L33-1
Fan motor - GE KGP 39 00 3006S
Power cord - Bronco 12-3
Power plug - Hubbell 9965
Chamber light - Bryand 400 base w/GE 25 watt oven lamp
Fuses - Buss (noted)
Heater - Eagle 415, 115 V

MISSIMERS INCORPORATED 3737 SAN FERNANDO ROAD GLENDALE 4, CALIFORNIA		
SCALE N/A	JOB SANDIA CORP.	DATE 1-5-61
ENGINEER G.F.C.	WIRING SCHEMATIC	DRAWING NO. C-993-2C
DRAFTSMAN WW	MODEL FT 1-100 X 500	
REVISED		



BILL OF MATERIALS

1. BW BRL 33-1
2. Penn 4P9
3. Penn 4P8
4. Superior 826-4S
5. Mueller 16000
6. Alco 402-1-FL 15# MOP
7. Missimers CP 1/2
8. BW L33-1
9. McCord RAC-16
10. Aminco 500
11. AP 204CB2 60661
12. Mueller 16000
13. 5/16 OD soft cop tube - 40'
14. Std 204 receiver
15. n/a
16. Missimer GM 600
17. n/a
18. GC K-25 SW 1442
19. Asco 826293
20. 3/8 finned wolverine - 2'
21. Penn 4P3
22. Penn 4P2
23. SUPERIOR 7186S

MISSIMERS INCORPORATED		
3737 SAN FERNANDO ROAD — GLENDALE 4, CALIFORNIA		
SCALE N/A	JOB SANDIA CORP	DATE 1-5-61
ENGINEER G.F.C	REFRIG PIPING SCHEMATIC	DRAWING NO. C-993-3C
DRAFTSMAN WW	MODEL FT-1-100X500	
REVISED 1-30-61 WW		

AIR COOLED 4 TO 1 HP S-101

525

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